1992 HOUSATONIC RIVER SURVEY

COMMONWEALTH OF MASSACHUSETTS

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

DEPARTMENT OF ENVIRONMENTAL PROTECTION

OFFICE OF WATERSHED MANAGEMENT

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1992 HOUSATONIC RIVER SURVEY

WATER QUALITY DATA
WATER QUALITY ANALYSIS

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FOREWORD

The Massachusetts Division of Water Pollution Control was established by the Massachusetts Clean Water Act, Chapter 21 of the General Laws as amended by Chapter 685 of the Acts of 1966. Included in the duties and responsibilities of the Division was the periodic examination of the water quality of various coastal waters, rivers, streams, and ponds of the Commonwealth, as stated in Section 27, Paragraph 5 of the Acts. This section further directed the Division to publish the results of such examination, together with the standards of water quality established for the various waters. Today, the Office of Watershed Management within the Massachusetts Department of Environmental Protection has among its responsibilities, the execution of this directive. This report is published under the Authority of the Acts, and is among a continuing series of reports issued by the Department presenting water quality data and analyses, water quality management plans, baseline and intensive limnological studies and special studies.

DISCLAIMER

Reference to trade names, commercial products, manufacturers, or distributors, in this report constitutes neither endorsement nor recommendations by the Massachusetts Department of Environmental Protection for their use.

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MASSACHUSETTS HOUSATONIC BASIN DESCRIPTION

The Massachusetts portion of the Housatonic River, hereinafter referred to as the Upper Housatonic Basin, is located in Berkshire County, Massachusetts. The watercourse runs nearly north to south; 545 square miles drain into 69 miles of river. Thirteen wastewater streams empty into the Housatonic River. Of these three discharges are of particular interest to analysis of the phosphorus problem: the General Electric Company and the Pittsfield Wastewater Treatment Plant (WWTP) in Pittsfield, and the Kimberly-Clark Corporation in Lee. Stream stations of interest are: Woods Pond in Lee/Lenox, the Great Barrington USGS gage, and Andrus Road in Sheffield.

Human uses of the river include industrial, agricultural, wildlife management (e.g. Woods Pond), and recreational. The Housatonic River is designated as a Class B cold water fishery in its headwaters (miles 69.0 to 60.9) and a Class B warm water fishery from mile 60.9 to the Connecticut state line.

WATER QUALITY BACKGROUND

The 1992 Summary of Water Quality ("305b") reports (Table 1) indicated that the mainstem from General Electric Co., Pittsfield to the Massachusetts border was classified as non-support, and the East Branch headwaters to General Electric was classified as non-support (see Figure 1). The only full-support portion in this basin was the Williams River tributary.

The causes of non-support were the PCB's in sediment and fish tissue downstream from General Electric, eutrophication due to phosphorus in the water column as well as in the sediments, and fecal coliform bacteria. The cause of partial support in the segment upstream of General Electric were pathogens (fecal coliform bacteria), present in the water column. Fecal coliform bacteria counts have consistently been above the Water Quality Standard (200 colonies/100 ml) throughout the basin in all past surveys.

In addition to the documented sources (municipal and industrial discharges) of bacteria and phosphorus, it is likely that there are other contributors (nonpoint sources) as well: stormwater runoff, failing septic systems, and agricultural runoff.

Background Water Quality Surveys

Basin-wide water quality surveys were completed by the Massachusetts Division of Water Pollution Control in 1974, 1977, 1978, 1981, and 1985. The 1974, 1977, 1978, and 1985 surveys were comprehensive in scope, and measured several water quality parameters (dissolved oxygen, pH, biochemical oxygen demand, solids, nutrients, coliform bacteria). The 1981 survey concentrated on phosphorus and dissolved oxygen.

Wastewater discharge sampling was conducted in 1974, 1976, 1977, 1978, 1979, and 1985 for the standard constituents. The 1981 sampling included only phosphorus. In 1975, a 303(e) basin plan was prepared which recommended substantial operational improvements in wastewater treatment plants (municipal and industrial) throughout the basin.

TABLE 1

1992 SUMMARY OF WATER QUALITY OF THE HOUSATONIC BASIN

East Branch Housatonic River

(MA21-01) Headwaters to Crane Paper. Miles 69.0 -60.0

Length: 9.00mi
Status: Partial Support
Class: B/Cold Water Fishery

Cause	Sources
Pathogens	Urban runoff/Storm sewers Onsite wastewater systems (septic tanks)
Unknown toxicity	Source unknown

(MA21-02) Crane Paper to confluence with West Branch Housatonic River. Miles 60.0-55.4

Length: 4.60mi
Status: Non-support
Class: B/Warm Water Fishery

Causes	Sources
Priority organics Pathogens	Industrial Point Sources Onsite wastewater systems (septic tanks) Urban runoff/Storm sewers

West Branch Housatonic River (2105775)

(MA21-03) Route 20 bridge to confluence with East Branch Housatonic River. Miles 1.5-0.0

Length: 1.50mi
Status: Non-support
Class: B/Cold Water Fishery

Causes	Sources
	Onsite wastewater systems (septic tanks) Pasture land
Pathogens	Urban runoff/Storm sewers

Housatonic River (2103450)

(MA21-04) Confluence with East Branch Housatonic and West Branch Housatonic rivers to outlet Woods Pond, Lee. Miles 55.4-45.1

Length: 10.30mi
Status: Non-Support
Class: B/Warm Water Fishery

Causes	Sources
Priority organics	Industrial Point Sources Agriculture
Pathogens	Urban runoff/Storm sewers Municipal Point Sources

TABLE 1 (CONTINUED)

1992 SUMMARY OF WATER QUALITY OF THE HOUSATONIC BASIN

Housatonic River (Continued)

(MA21-05) Outlet Woods Pond to Connecticut State Line. Miles 45.1-0.0

Length: 45.10mi
Status: Non-Support
Class: B/Warm Water Fishery

Causes	Sources
	Urban runoff/Storm sewers
	Onsite wastewater systems (septic tanks)
Priority organics	Industrial Point Sources
Pathogens	Municipal Point Sources

Williams River

(MA21-06) Source to confluence with Housatonic River. Miles 10.0-0.0

Length: 10.00mi
Status: Support
Class: B/Cold Water Fishery

Causes	Sources
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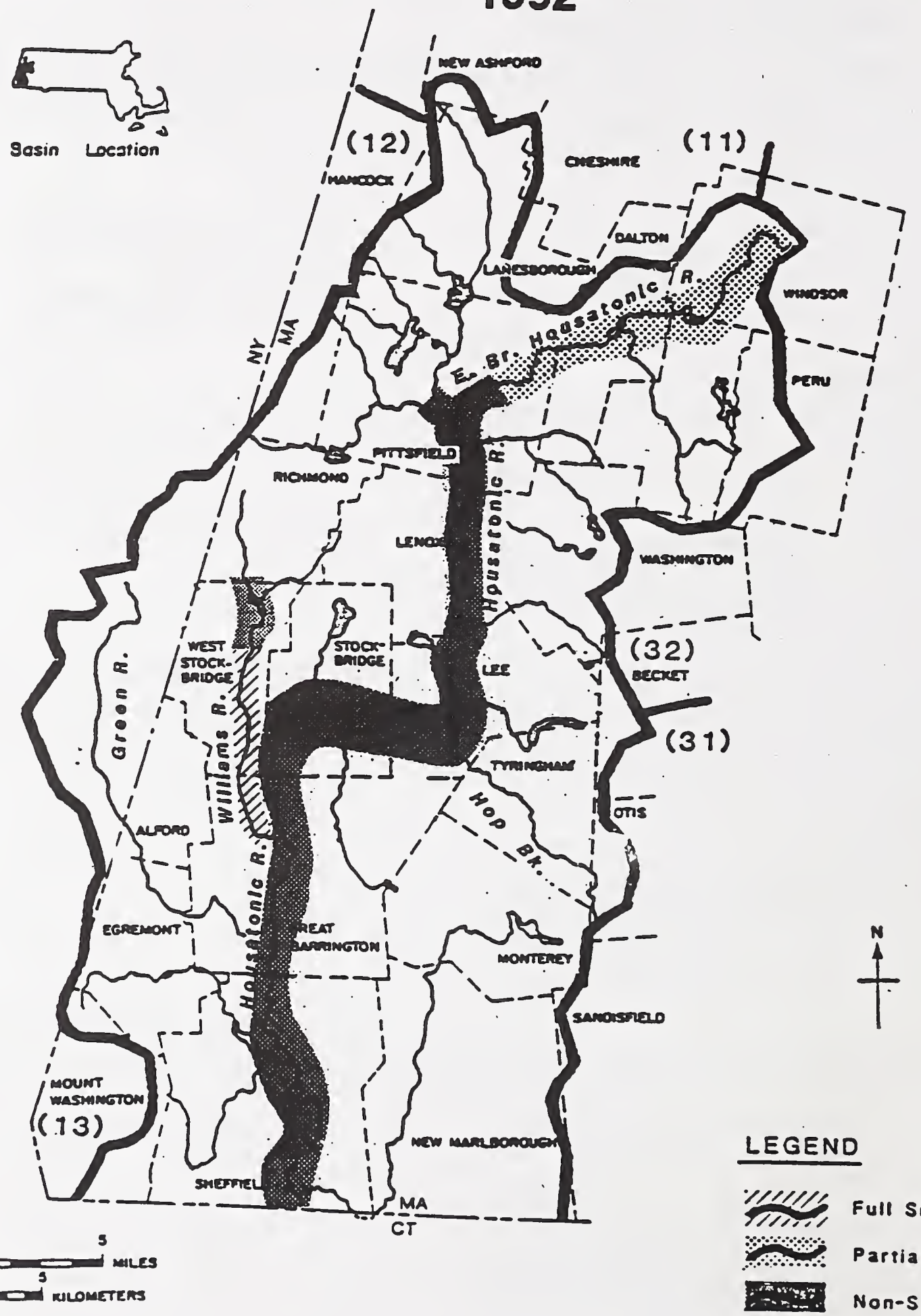
Figure 1 HOUSATONIC RIVER BASIN

SUMMARY OF WATER QUALITY

1992



Background Water Quality Trends

Earlier Division studies (1974, 77, 78) indicated water quality problems and violations of water quality standards with: dissolved oxygen levels, fecal coliform counts, phosphorus and PCB's in various parts of the basin. Starting with the 1979 report, considerable improvements began to be noticed. The 1981 report indicated that problems with dissolved oxygen continued in the Pittsfield area of the Housatonic, as well as elevated fecal coliform counts scattered throughout the basin. PCB's, although no longer discharged to the river after 1977, still remained a complex problem in sediments and fish throughout the basin. The dissolved oxygen problems in the Pittsfield area no longer existed in the 1985 survey results. Fecal coliform counts averaged lower throughout the basin in 1985 than in 1977-78. However, violations above the water quality standard (200 org/100 ml) continued at approximately half the stations throughout the basin, though the violations in 1985 ranged in the 200-1000 count compared with the 200-20,000 range count in 1977.

The two main problems of concern over the past 20 years have been PCB's (largely in sediments and fish), and phosphorus in the water column and in sediments.

Polychlorinated Biphenyls

PCB in the Housatonic River system originated largely at the General Electric complex in Pittsfield. PCB is a dielectric fluid, and was used in the past for a variety of applications. General Electric discontinued their use of PCB in 1977. Residual PCB was reduced by cleaning up machine and production areas; storm sewers in the General Electric complex were relined. PCB is monitored continually: weekly flow-composited samples are analyzed, and the results are sent to EPA and the Department of Environmental Protection.

PCB is insoluble in water; it adheres to in-stream suspended solids and can be stored in sediments at the bottom of streams and ponds. In 1980 the Connecticut Agricultural Experiment Stations surveyed Housatonic River sediments from Pittsfield to Lake Zoar in Connecticut. Relative storage is: 70% in Massachusetts (mostly in Woods Pond), 25% in Lake Lillanonah, CT, and 5% in Lake Zoar, CT. Frink (1980) projects that 26,000 pounds of PCB are stored in Woods Pond. Mean 1980 sediment PCB concentrations in Woods Pond and Risingdale Impoundment were 35.2 ppm and 2.40 ppm, respectively.

Phosphorus

Phosphorus has been a long-term problem throughout the basin (Massachusetts and Connecticut), thought to originate primarily from point source dischargers. A summary of 1978 and 1981 inputs was published in the Division's, "1981 Housatonic River Report on Analysis of Phosphorus Dynamics," and the 1985 inputs were calculated from data in the Division's 1985 Water Quality Data Report:

UPPER HOUSATONIC BASIN TOTAL PHOSPHORUS INPUTS

Wastewater Discharge	1978 Total Phosphorus lbs/day	(% total)	1981 Total Phosphorus lbs/day	(% total)	1985 Total Phosphorus lbs/day	(% total)
Crane Paper Co.	33	(14)	9	(2.3)	1.9	(1.0)
General Electric Co.:						
Outfall 005	-	-	1.2	(0.3)	0.2	(0.1)
Outfall 006	-	-	9	(2.3)	0.3	(0.1)
Pittsfield WWTP	100	(42)	280	(72)	138	(71)
Lenox Center WWTP	7.6	(3.2)	11	(2.8)	-	-
Lenoxdale WWTP	1.3	(0.6)	0.7	(0.2)	2.5	(1.2)
Kimberly-Clark Corp.:						
primary effluent	17	(7.2)	6.0	(1.5)	2.9	(1.5)
secondary effluent	31	(13)	35	(9.0)	28.6	(15.0)
Lee WWTP	11	(4.7)	13	(3.4)	3.9	(2.0)
Mead Paper Co.:						
Willow Mill	19	(8.1)	0.9	(0.2)	0.6	(0.2)
Laurel Mill	4.1	(1.7)	1.0	(0.3)	0.5	(0.2)
Stockbridge WWTP	2.6	(1.1)	2.4	(0.6)	3.1	(1.7)
Great Barrington WWTP	9.1	(3.9)	18	(4.6)	12	(6.0)
Total	**240**		**390**		**195**	

Phosphorus inputs from known point sources had generally declined between 1978 and 1985. This has probably been due to overall improved waste treatment processes and the application of phosphorus removal processes at some of the plants. Subsequent to the publication of the 1985 report, Pittsfield (the principal phosphorus contributor), initiated year-round phosphorus removal, which should have lowered the overall downstream phosphorus loadings. One of the working objectives of the 1992 survey was to document the effects of year-round phosphorus removal at the Pittsfield WWTP.

It is likely that there are other factors besides point sources which are adding to overall in-stream phosphorus loadings in the basin, namely nonpoint source, e.g., agriculture/farming activities. To date, however, these loadings have not been quantified.

1992 HOUSATONIC RIVER SURVEY METHODS

Samples for water quality analysis were collected from: fourteen (14) stations along the Housatonic River mainstem; five (5) stations along four (4) tributaries near their confluence with the mainstem; eight water withdrawal sites in the Housatonic Basin identified as needing new Water Management Act (WMA) permits; and twelve dischargers, of which six (6) were municipal WWTP's and six (6) were industries. Sampling was conducted on August 4, 5, and September 22, 1992.

Two mainstem and adjacent tributary sampling runs were conducted on each of these three days with two survey teams, one for the northern part of the basin (north of Massachusetts Turnpike) and the other for the southern part of the basin, (south of Massachusetts Turnpike). Sampling runs were conducted by the two teams starting at 3:00 a.m., and 2:00 p.m. each day. Procedures used for bottle preparation, sampling technique, and sample handling are outlined in the Basin Planning Program SOP document (MDWPC 1989).

A dissolved oxygen sample was collected and fixed at each station during each sampling run. Discrete grab samples for fecal coliform counts and the measurement of biochemical oxygen demand (BOD) were obtained during the morning runs only on each sampling date. Grab samples for chemical analyses (alkalinity, suspended and total solids, turbidity, and chlorides), nutrients (including Total Kjeldahl, ammonia- and nitrate-nitrogen and total phosphorus), and total and dissolved metals (Al, Cd, Cr, Cu, Fe, Hg, Ni, Zn, As, and Pb) were collected on both the morning and afternoon runs, and then combined to form daily composite samples. Samples for volatile/purgeable organics analysis were collected at four stations during the afternoon surveys of August 4 and 5, only. Twenty-four hour composite samples of the effluent from twelve wastewater outfalls were collected on all three survey dates for all of the analytes listed above except dissolved oxygen. Results of the wastewater sampling are not published here, but are on file at the Office of Watershed Management.

All samples were preserved as necessary and transported on ice to the Lee POTW laboratory, which was being used as the field laboratory during the 1992 Housatonic River Survey. The dissolved oxygen samples were titrated according to the azide modification of the Winkler method (MDWPC 1989) at the Lee POTW laboratory. Filtration of the dissolved metal samples was also conducted at the Lee POTW laboratory, after which the samples were preserved. While samples for dissolved metals analyses were obtained from all stations during the August surveys, only seven stations were selected for the determination of dissolved metal concentration in September. Total metals were analyzed for all sampling sites on all three survey dates. Following sample preparation at the field laboratory the samples were transported to the Lawrence Experiment Station (LES) where they were analyzed according to American Public Health Association (APHA) approved methods (Greenberg et al. 1992). Quality control data and procedures are on file at the LES laboratory.

In addition to the water sampling effort described above, the USEPA collected samples for chlorophyll and phosphorus analyses and algae identifications from Lake Lillinonah in Connecticut on August 5 and 19, and September 2, 1992.

Finally, sampling at water withdrawal sites consisted of the collection of water samples for physicochemical analytes as described above, in conjunction with an evaluation of the condition of selected biological communities upstream and downstream from the withdrawals. Results of this effort were published under separate cover (Kennedy et al. 1993).

TABLE 2

1992 HOUSATONIC RIVER SURVEY

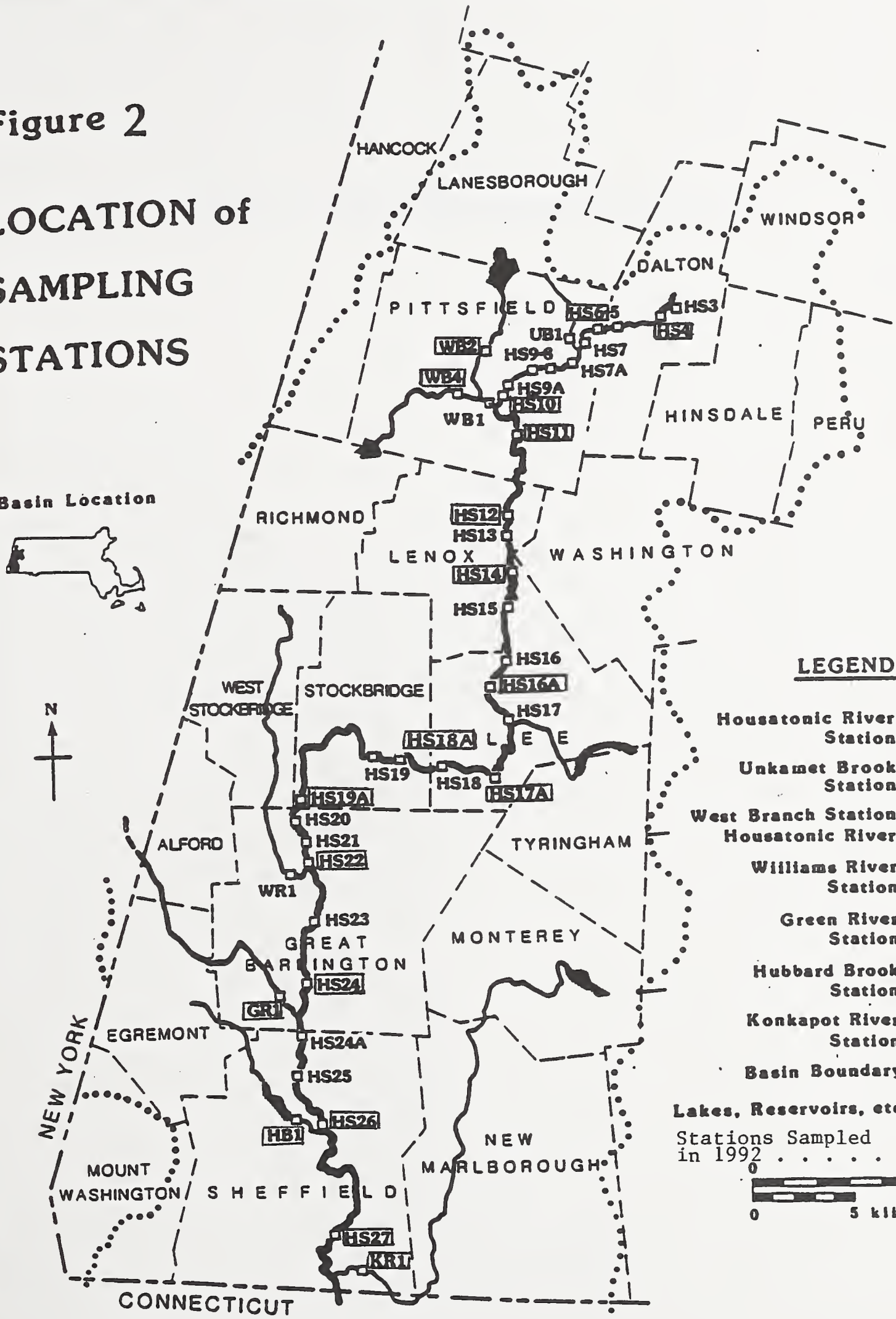
LOCATION OF MAINSTEM SAMPLING STATIONS

STATION NUMBER	DESCRIPTION AND LOCATION	RIVER MILES
HS04	Bridge on Rt. 8 (Outlet of Center Pond), Dalton	55.4, 7.5
HS06	Bridge on Hubbard Ave. (USGS Gage at Coltsville), Pittsfield	55.4, 5.1
HS10	Bridge on Pomeroy Ave. (above confluence with the West Branch of the Housatonic River), Pittsfield	55.4, 0.3
HS11	Bridge on Pomeroy Ave. (below confluence with the West Branch of the Housatonic River), Pittsfield	54.7
HS12	Bridge on New Lenox Rd., Lenox	49.5
HS14	Lenox Station, just below dam outlet, Woods Pond	44.9
HS16A	Bridge on Rt. 20, Lee	41.4
HS17A	Off Meadow St., South Lee	36.5
HS18A	Bridge on Rt. 7, Stockbridge	35.5
HS19A	Second bridge on Glendale Middle Rd., Stockbridge	26.0
HS22	Bridge on Division St. (USGS Gage at Great Barrington), Van Deusenville	23.9
HS24	Bridge on Brookside Rd., Great Barrington	17.1
HS26	Bridge on Maple St. (labelled County Rd. on USGS map), Sheffield	9.0
HS27	Bridge on Andrus Rd., Sheffield	2.0
	TRIBUTARIES TO THE HOUSATONIC RIVER	
WB2	West Branch of the Housatonic River at bridge on Housatonic St. (Route 20), Pittsfield	55.4, 1.4
WB4	Southwest Branch of the Housatonic River at bridge on Parker Rd., Pittsfield	55.4, 1.5
GP1	Goose Pond Brook at bridge on Tyringham Road	40.0, 0.1
HB1	Hubbard Brook, bridge on Rt. 7, Sheffield	15.9, 0.1
KR1	Konkapot River, bridge on Rt. 7, Ashley Falls	0.2, 0.8

HOUSATONIC RIVER BASIN

Figure 2

LOCATION of SAMPLING STATIONS



1992 HOUSATONIC RIVER BASIN WATER QUALITY DATA

TABLE 3

1992 HOUSATONIC RIVER SURVEY

DISSOLVED OXYGEN (mg/l); TIME; SAMPLE TEMPERATURE (°C)

August 4, 1992

STATION NUMBER	A.M. RUN TIME	A.M. RUN °C TEMPERATURE	A.M. RUN D.O.	P.M. RUN TIME	P.M. RUN °C TEMPERATURE	P.M. RUN D.O.
			MAINSTEM			
HS04	0300	20.0	8.5	1420	19.0	7.8
HS06	0315	19.0	7.2	1435	20.0	8.2
HS10	0315	19.0	6.4	1510	20.0	7.5
HS11	0335	19.0	6.5	1545	20.0	7.4
HS12	0445	19.0	7.2	1545	19.5	7.2
HS14	0515	20.0	10.7	1605	20.0	9.2
HS16A	0530	19.5	7.3	1625	21.0	8.8
HS17A	0520	20.0	6.0	1607	22.0	8.4
HS18A	0505	19.0	7.0	1552	22.0	7.6
HS19A	0450	20.0	8.0	1542	23.0	7.2
HS22	0430	20.0	8.1	1530	23.0	8.9
HS24	0410	20.0	7.4	1505	22.0	8.6
HS27	0320	21.0	8.6	1425	22.0	8.8
			TRIBUTARIES			
WB02	0400	19.5	7.5	1520	20.0	7.8
WB04	0415	18.5	8.0	1530	20.0	8.2
GP01	0535	18.0	8.3	1640	19.5	9.0
HB01	0355	19.0	7.0	1450	21.0	7.2
KR01	0300	20.0	7.7	1415	20.0	10.2

TABLE 3 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

DISSOLVED OXYGEN (mg/l); TIME; SAMPLE TEMPERATURE (°C)

August 5, 1992

STATION NUMBER	A.M. RUN TIME	°C TEMPERATURE	D.O.	P.M. RUN TIME	°C TEMPERATURE	D.O.
			MAINSTEM			
HS04	0300	18.0	7.9	1545	19.5	9.0
HS06	0315	18.0	8.3	1558	19.5	8.7
HS10	0345	17.0	7.2	1640	19.5	7.9
HS11	0330	18.0	7.1	1650	19.5	7.4
HS12	0430	18.0	6.7	1735	19.0	7.5
HS14	0450	19.0	9.0	1755	20.0	15.5
HS16A	0515	18.0	8.0	1810	20.0	7.8
HS17A	0445	20.0	7.1	1612	21.0	8.6
HS18A	0433	19.0	7.6	1600	20.0	8.4
HS19A	0422	19.0	6.8	1550	21.0	7.9
HS22	0405	19.0	8.1	1535	22.0	8.6
HS24	0350	19.0	7.6	1445	21.0	8.7
HS26	0325	19.0	7.5	1423	20.0	8.7
HS27	0310	20.0	7.3	1410	20.0	8.6
			TRIBUTARIES			
WB02	0400	18.0	7.9	1710	20.0	8.0
WB04	0415	16.0	7.8	1715	20.0	8.1
GP01	0530	14.0	9.2	1820	18.5	8.8
HB01	0335	19.0	7.1	1432	21.0	7.9
KR01	0300	19.0	7.9	1400	18.0	8.4

TABLE 3 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

DISSOLVED OXYGEN (mg/l); TIME; SAMPLE TEMPERATURE (°C)

September 22, 1992

STATION NUMBER	A.M. RUN TIME	A.M. RUN °C TEMPERATURE	A.M. RUN D.O.	P.M. RUN TIME	P.M. RUN °C TEMPERATURE	P.M. RUN D.O.
			MAINSTEM			
HS04	0325	17.0	10.0	1400	17.0	7.5
HS06	0345	18.0	7.9	1410	19.0	7.7
HS10	0445	18.0	7.1	1500	19.0	7.4
HS11	0500	18.0	7.1	1515	18.0	8.1
HS12	0525	18.0	8.0	1530	18.0	7.5
HS14	0545	19.0	7.3	1550	19.0	7.5
HS16A	0605	19.0	7.1	1605	19.0	7.2
HS17A	0510	17.0	7.4	1618	19.5	7.1
HS18A	0457	17.0	7.3	1605	19.0	7.7
HS19A	0445	18.0	8.3	1555	19.0	7.9
HS22	0422	17.0	8.4	1530	19.0	7.9
HS24	0402	17.0	8.0	1503	18.5	8.5
HS26	0335	17.0	8.1	1433	18.5	8.2
HS27	0300	15.5	8.1	1410	18.0	8.2
			TRIBUTARIES			
WB02	0410	18.0	8.0	1435	19.0	9.2
WB04	0425	17.0	7.6	1445	19.0	8.8
GP01	0620	18.0	8.7	1620	19.0	8.5
HB01	0347	16.5	7.2	1450	18.0	7.7
KR01	0300	15.5	8.1	1410	17.0	9.7

Figure 3

HOUSATONIC SURVEY 1992

DISSOLVED OXYGEN (mg/l)

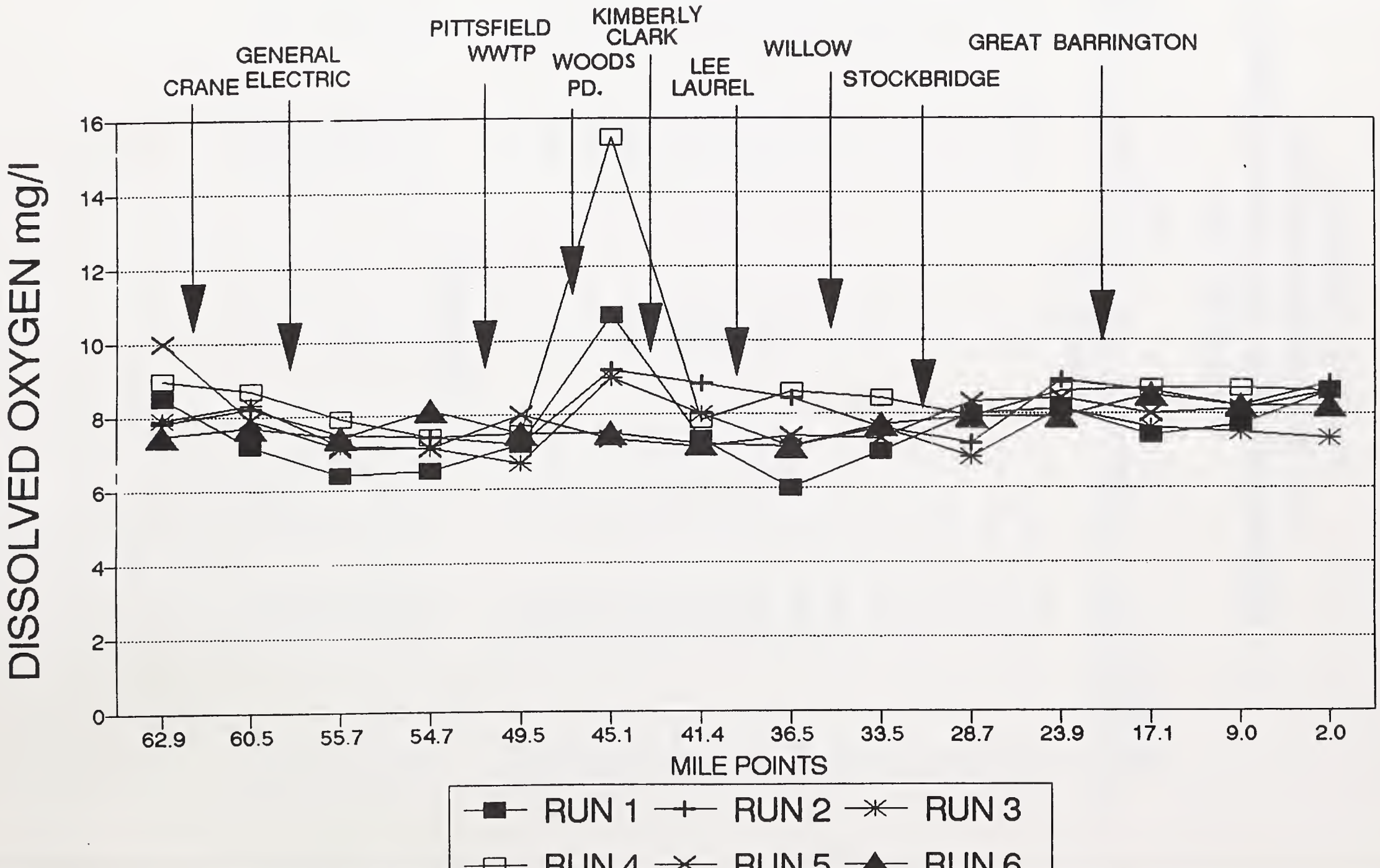


TABLE 4

1992 HOUSATONIC RIVER SURVEY

pH

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92
		MAINSTEM		
HS04	62.9	7.1	6.7	7.4
HS06	60.5	7.3	7.5	7.7
HS10	55.7	7.2	7.5	7.4
HS11	54.7	7.2	7.4	7.5
HS12	49.5	7.1	7.3	7.6
HS14	45.1	8.2	8.2	7.1
HS16A	41.4	7.0	7.7	7.4
HS17A	36.5	7.4	7.5	7.9
HS18A	33.5	7.5	7.2	7.7
HS19A	28.7	7.5	7.3	8.0
HS22	23.9	7.2	7.4	8.0
HS24	17.1	7.2	7.4	8.1
HS26	9.0	7.8	7.5	8.0
HS27	2.0	8.0	7.5	8.0
		TRIBUTARIES		
WB02		7.1	7.3	7.8
WB04		7.1	7.5	7.9
GP01		6.9	7.6	7.8
HB01		7.8	7.0	7.8
KR01		6.9	6.2	7.9

TABLE 5

1992 HOUSATONIC RIVER SURVEY

BOD_5 (mg/l)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
		MAINSTEM			
HS04	62.9	2.1	3.0	3.3	2.8
HS06	60.5	2.1	3.0	2.7	2.6
HS10	55.7	3.0	3.9	3.3	3.4
HS11	54.7	2.4	3.3	1.8	2.5
HS12	49.5	2.1	3.0	2.7	2.6
HS14	45.1	3.9	3.6	2.4	3.3
HS16A	41.4	3.0	3.6	3.3	3.3
HS17A	36.5	3.3	2.4	2.7	2.8
HS18A	33.5	-	3.3	2.7	3.1
HS19A	28.7	1.8	3.0	2.1	2.3
HS22	23.9	2.1	3.9	2.4	2.8
HS24	17.1	2.4	3.3	3.3	3.0
HS26	9.0	2.1	2.1	1.8	2.0
HS27	2.0	2.1	2.4	1.5	2.0
		TRIBUTARIES			
WB02		3.6	2.4	1.8	2.6
WB04		2.7	1.8	0.9	1.8
GP01		2.7	1.8	1.2	1.9
HB01		1.5	2.1	1.5	1.7
KR01		1.5	3.6	1.5	2.2

Figure 4

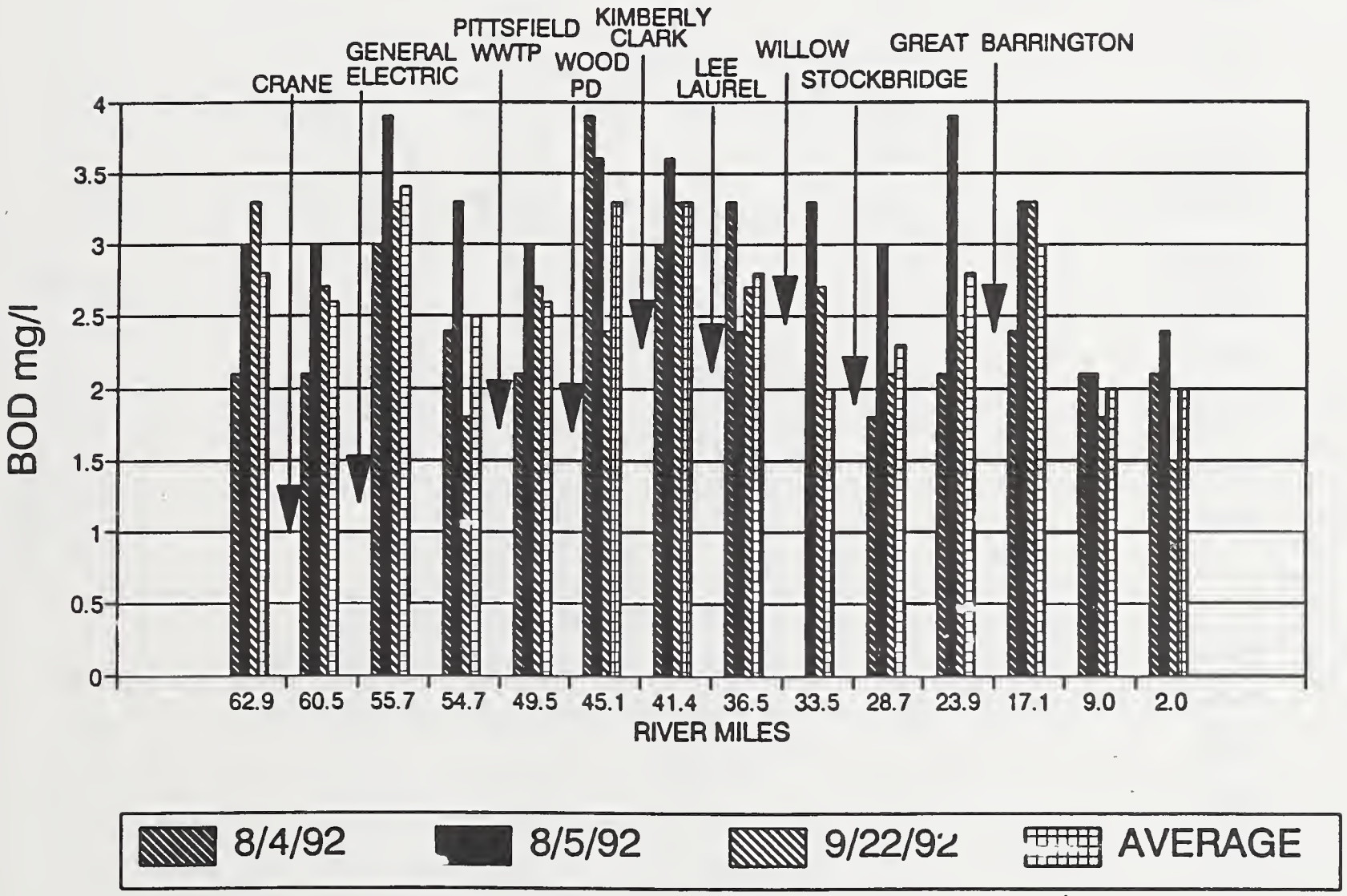

HOUSATONIC SURVEY 1992
BOD vs RIVER MILES
CRANE
GENERAL ELECTRIC
PITTSFIELD WWTP
WOOD PD
KIMBERLY CLARK
LEE
LAUREL
WILLOW
STOCKBRIDGE
GREAT BARRINGTON
BOD mg/l
4
3.5
3
2.5
2
1.5
1
0.5
0
62.9
60.5
55.7
54.7
49.5
45.1
41.4
36.5
33.5
28.7
23.9
17.1
9.0
2.0
RIVER MILES
8/4/92
8/5/92
9/22/92
AVERAGE

TABLE 6

1992 HOUSATONIC RIVER SURVEY

AMMONIA-NITROGEN (mg/l)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
		MAINSTEM			
HS04	62.9	0.03	0.03	0.02	0.03
HS06	60.5	0.05	0.04	0.05	0.05
HS10	55.7	0.18	0.12	0.28	0.19
HS11	54.7	0.11	0.08	0.17	0.12
HS12	49.5	0.14	0.10	0.11	0.12
HS14	45.1	<0.02	0.04	0.08	0.04
HS16A	41.4	0.05	0.08	<0.02	0.05
HS17A	36.5	0.13	0.06	0.15	0.11
HS18A	33.5	0.08	0.05	0.11	0.08
HS19A	28.7	0.04	0.07	0.02	0.04
HS22	23.9	0.04	0.04	0.02	0.03
HS24	17.1	<0.02	0.02	0.12	0.05
HS26	9.0	<0.02	<0.02	0.04	0.03
HS27	2.0	<0.02	<0.02	0.04	0.03
		TRIBUTARIES			
WB02		0.02	0.07	0.04	0.04
WB04		0.05	0.06	0.04	0.05
GP01		<0.02	0.06	<0.02	0.03
HB01		<0.02	0.03	<0.02	0.02
KR01		<0.02	<0.02	0.02	0.02

Figure 5

HOUSATONIC SURVEY 1992

AMMONIA-N vs RIVER MILES

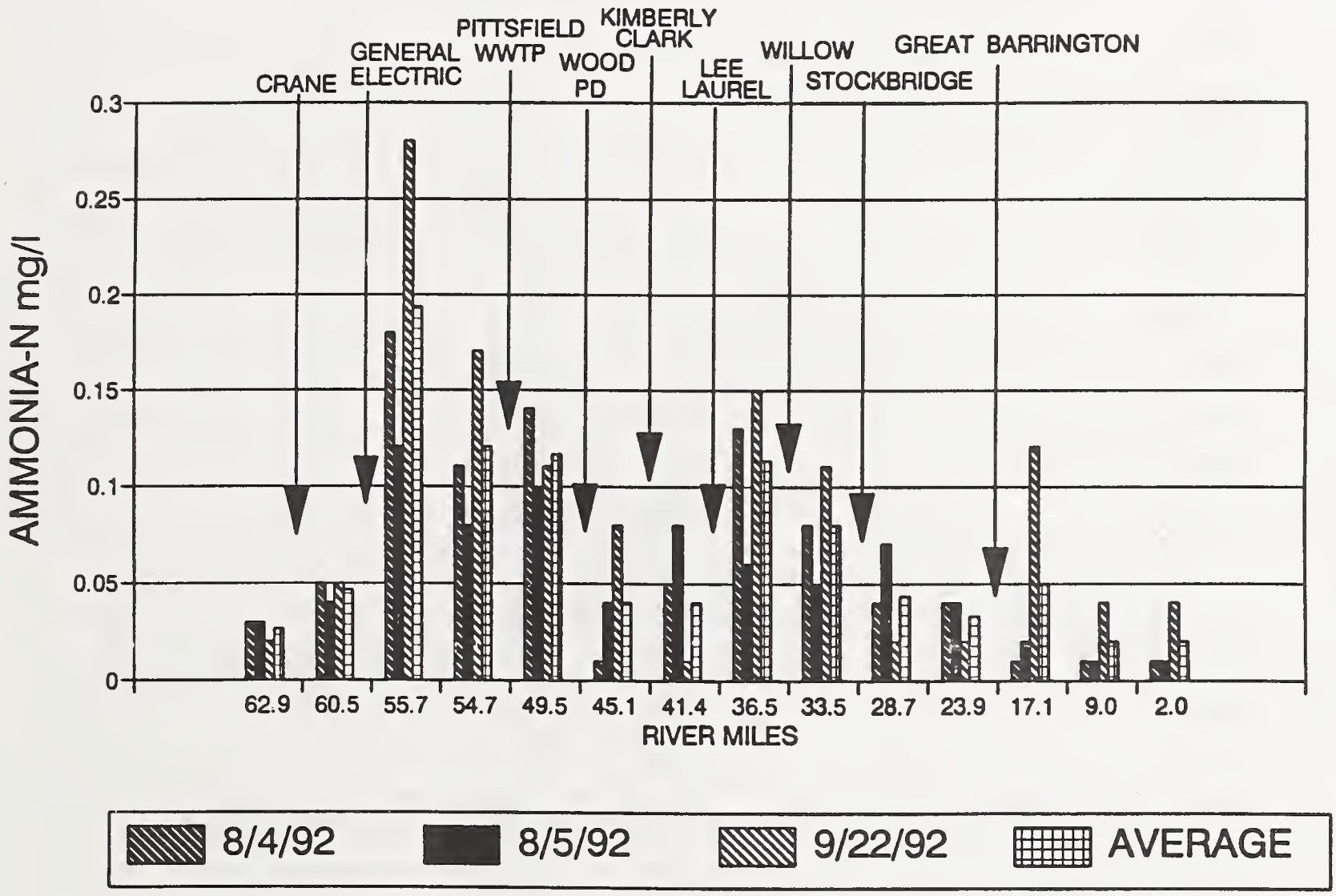


TABLE 7

1992 HOUSATONIC RIVER SURVEY

NITRATE-NITROGEN (mg/l)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
		MAINSTEM			
HS04	62.9	0.14	0.18	0.10	0.14
HS06	60.5	0.24	0.31	0.17	0.24
HS10	55.7	0.37	0.27	0.37	0.34
HS11	54.7	0.30	0.28	0.43	0.34
HS12	49.5	1.90	1.30	4.30	2.50
HS14	45.1	0.91	0.81	1.90	1.21
HS16A	41.4	1.10	1.60	1.70	1.13
HS17A	36.5	0.94	0.91	1.30	1.01
HS18A	33.5	0.92	1.00	1.30	1.06
HS19A	28.7	0.89	0.89	1.20	1.07
HS22	23.9	1.00	0.78	1.20	0.99
HS24	17.1	0.96	0.82	1.10	0.96
HS26	9.0	0.91	0.75	0.89	0.85
HS27	2.0	0.80	0.80	0.66	0.75
		TRIBUTARIES			
WB02		0.14	0.13	0.18	0.15
WB04		0.25	0.18	0.33	0.25
GP01		0.11	0.13	0.10	0.12
HB01		0.08	0.07	0.08	0.08
KR01		0.34	0.16	0.32	0.27

Figure 6

HOUSATONIC SURVEY 1992

NITRATE-N vs RIVER MILES

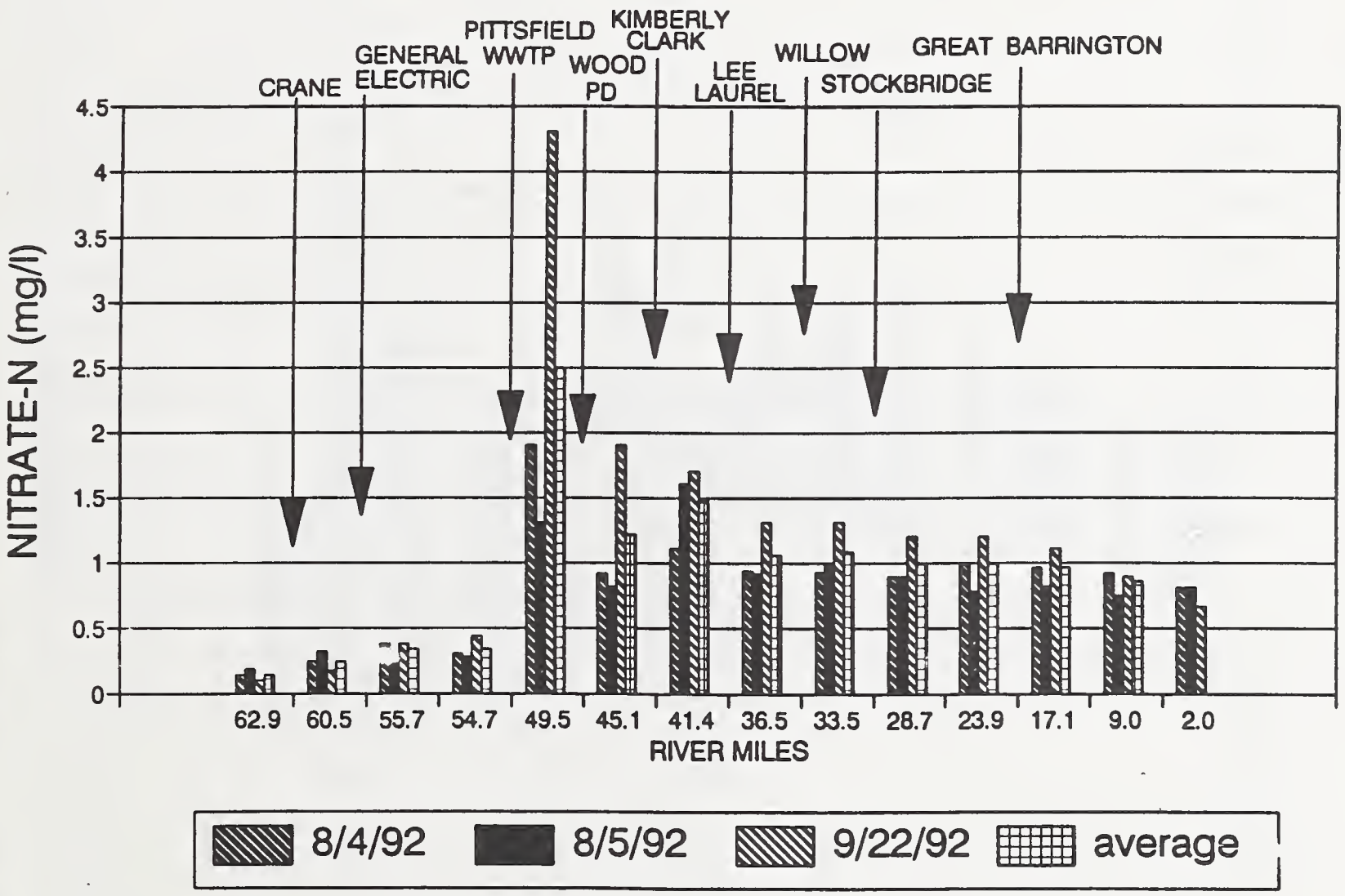


TABLE 8

1992 HOUSATONIC RIVER SURVEY

TOTAL KJELDAHL-NITROGEN (mg/l)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
		MAINSTEM			
HS04	62.9	0.33	0.58	0.38	0.43
HS06	60.5	0.80	0.83	1.20	0.94
HS10	55.7	0.79	0.73	1.00	0.84
HS11	54.7	0.59	0.56	0.61	0.59
HS12	49.5	0.55	0.58	0.52	0.55
HS14	45.1	0.68	0.90	0.76	0.78
HS16A	41.4	0.50	0.65	0.56	0.57
HS17A	36.5	0.66	0.79	0.80	0.71
HS18A	33.5	0.82	0.65	0.82	0.77
HS19A	28.7	0.82	0.53	0.63	0.67
HS22	23.9	0.76	0.67	0.55	0.66
HS24	17.1	0.68	0.69	0.54	0.64
HS26	9.0	0.60	0.57	0.47	0.55
HS27	2.0	0.53	0.60	0.46	0.53
		TRIBUTARIES			
WB02		1.10	0.34	0.37	0.60
WB04		0.71	0.32	0.24	0.43
GP01		0.21	0.23	0.28	0.24
HB01		0.26	0.40	0.45	0.37
KR01		0.26	0.70	0.21	0.39

Figure 7

HOUSATONIC SURVEY 1992

KJELDAHL N vs RIVER MILES

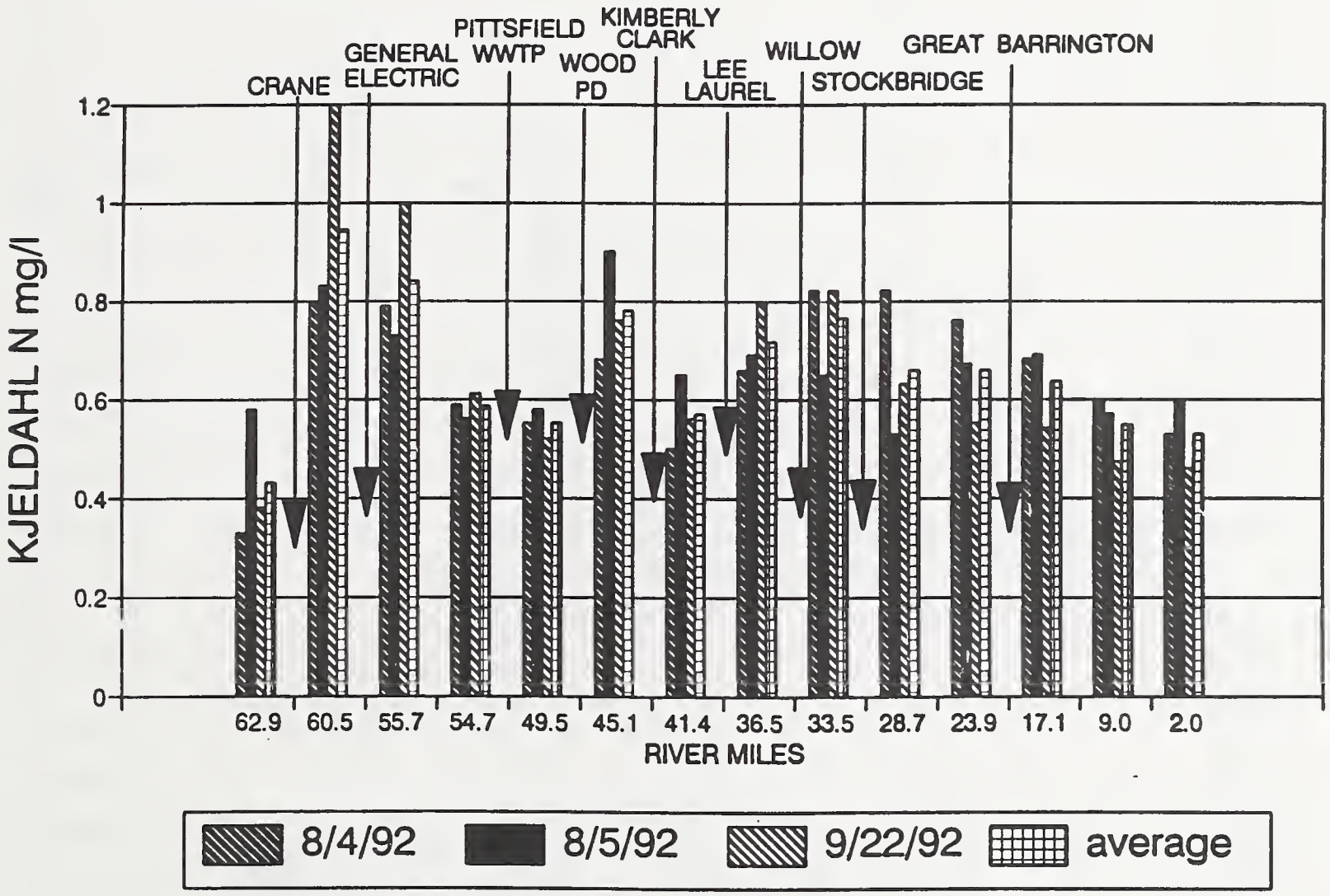


TABLE 9

1992 HOUSATONIC RIVER SURVEY

TOTAL PHOSPHORUS (mg/l)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
			MAINSTEM		
HS04	62.9	0.05	<0.03	<0.03	<0.04
HS06	60.5	<0.03	<0.03	<0.03	<0.03
HS10	55.7	0.09	<0.03	<0.03	<0.05
HS11	54.7	0.06	0.03	0.08	0.06
HS12	49.5	0.20	0.08	0.19	0.16
HS14	45.1	0.06	0.08	0.12	0.09
HS16A	41.4	0.09	0.11	0.10	0.10
HS17A	36.5	0.11	0.09	0.15	0.12
HS18A	33.5	0.08	0.11	0.10	0.09
HS19A	28.7	0.07	0.06	0.09	0.07
HS22	23.9	0.11	0.14	0.08	0.11
HS24	17.1	0.09	0.09	0.08	0.09
HS26	9.0	0.07	0.05	0.07	0.06
HS27	2.0	0.05	0.08	0.05	0.06
			TRIBUTARIES		
WB02		<0.03	<0.03	<0.03	<0.03
WB04		<0.03	<0.03	<0.03	<0.03
GP01		<0.03	<0.03	<0.03	<0.03
HB01		<0.03	<0.03	<0.03	<0.03
KR01		<0.03	<0.03	<0.03	<0.03
BR01		<0.03	-	-	-

Figure 8

HOUSATONIC SURVEY 1992
TOTAL PHOSPHORUS vs RIVER MILES

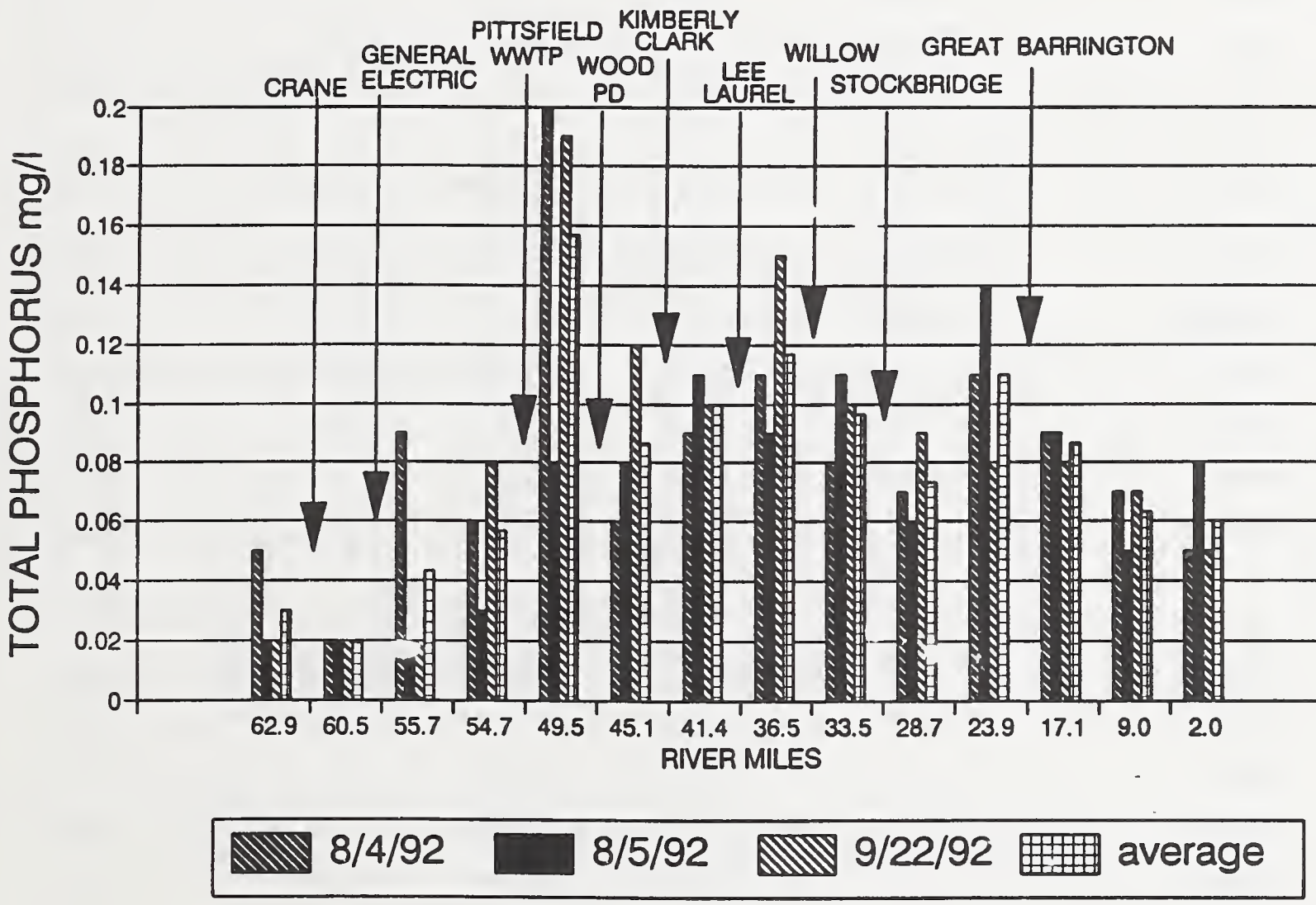


TABLE 10

1992 HOUSATONIC RIVER SURVEY

SUSPENDED SOLIDS (mg/l)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
		MAINSTEM			
HS04	62.9	3.0	7.0	<1.0	3.3
HS06	60.5	5.0	6.5	<1.0	4.0
HS10	55.7	7.5	14.0	2.5	8.2
HS11	54.7	7.0	13.0	2.5	7.3
HS12	49.5	5.0	12.0	2.0	6.3
HS14	45.1	5.0	9.5	3.5	6.0
HS16A	41.4	7.5	13.0	4.5	8.3
HS17A	36.5	7.0	13.0	4.0	8.0
HS18A	33.5	7.5	19.0	1.5	9.4
HS19A	28.7	6.0	7.0	1.5	4.8
HS22	23.9	6.0	79.0	3.5	15.3
HS24	17.1	10.0	23.0	6.0	13.0
HS26	9.0	8.0	12.0	6.0	8.8
HS27	2.0	5.8	11.0	3.0	6.6
		TRIBUTARIES			
WB02		19.0	18.0	2.0	13.0
WB04		14.0	13.0	5.0	10.7
GP01		12.0	4.5	<1.0	4.5
HB01		2.5	7.0	2.0	3.9
KR01		4.0	77.0	1.5	41.3

Figure 9

HOUSATONIC SURVEY 1992
SUSPENDED SOLIDS vs RIVER MILES

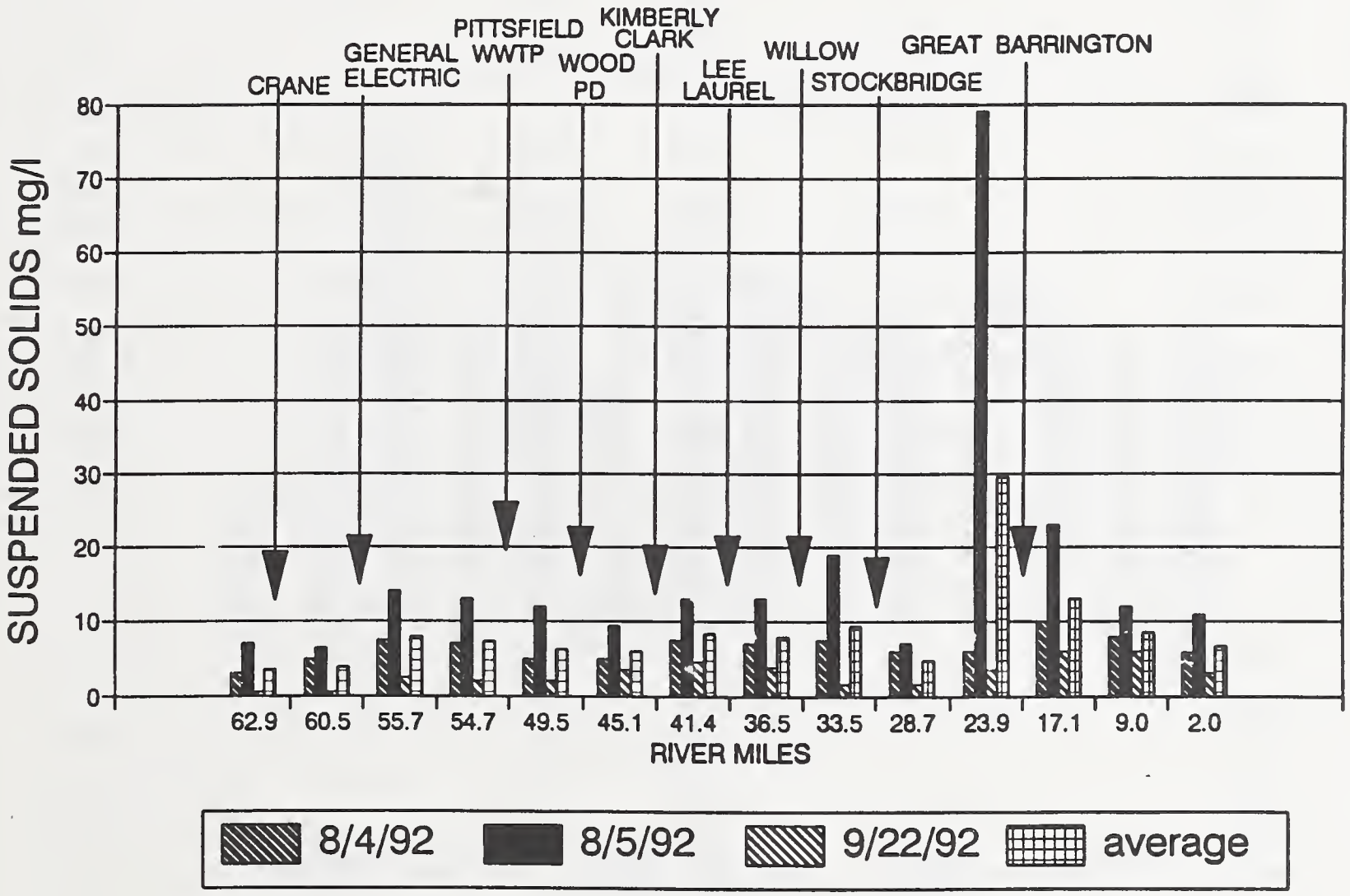


TABLE 11

1992 HOUSATONIC RIVER SURVEY

TOTAL SOLIDS (mg/l)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
		MAINSTEM			
HS04	62.9	132	98	134	121
HS06	60.5	244	146	290	227
HS10	55.7	326	214	328	289
HS11	54.7	226	196	278	233
HS12	49.5	242	206	292	240
HS14	45.1	204	202	282	229
HS16A	41.4	228	228	288	248
HS17A	36.5	266	199	267	244
HS18A	33.5	194	208	270	224
HS19A	28.7	200	224	246	223
HS22	23.9	224	278	250	251
HS24	17.1	224	232	248	235
HS26	9.0	216	196	230	214
HS27	2.0	202	186	226	205
		TRIBUTARIES			
WB02		180	152	178	170
WB04		210	170	220	200
GP01		162	144	150	151
HB01		134	132	174	147
KR01		184	455	176	272

Figure 10

HOUSATONIC SURVEY 1992

TOTAL SOLIDS vs RIVER MILES

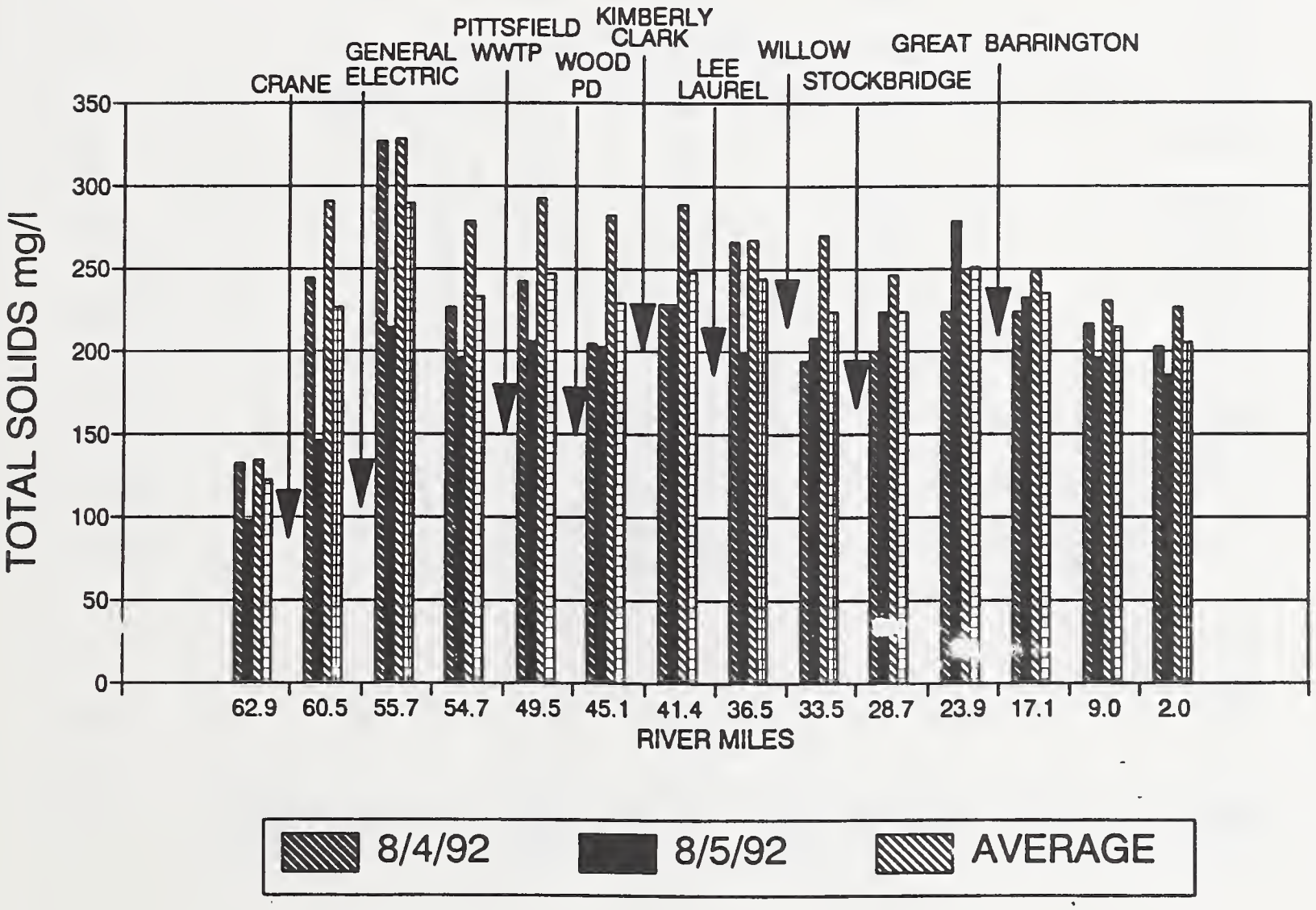


TABLE 12

1992 HOUSATONIC RIVER SURVEY

CHLORIDES (mg/l)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
		MAINSTEM			
HS04	62.9	15	5	12	11
HS06	60.5	29	14	12	18
HS10	55.7	66	31	38	45
HS11	54.7	36	24	70	43
HS12	49.5	19	23	52	31
HS14	45.1	35	31	50	42
HS16A	41.4	25	31	49	35
HS17A	36.5	26	23	49	33
HS18A	33.5	28	23	41	31
HS19A	28.7	26	26	41	31
HS22	23.9	29	26	35	30
HS24	17.1	27	27	34	29
HS26	9.0	27	20	35	27
HS27	2.0	28	22	32	27
		TRIBUTARIES			
WB02		12	7	29	16
WB04		27	20	19	22
GP01		29	29	7	22
HB01		5	5	21	10
KR01		1	7	11	6

Figure 11

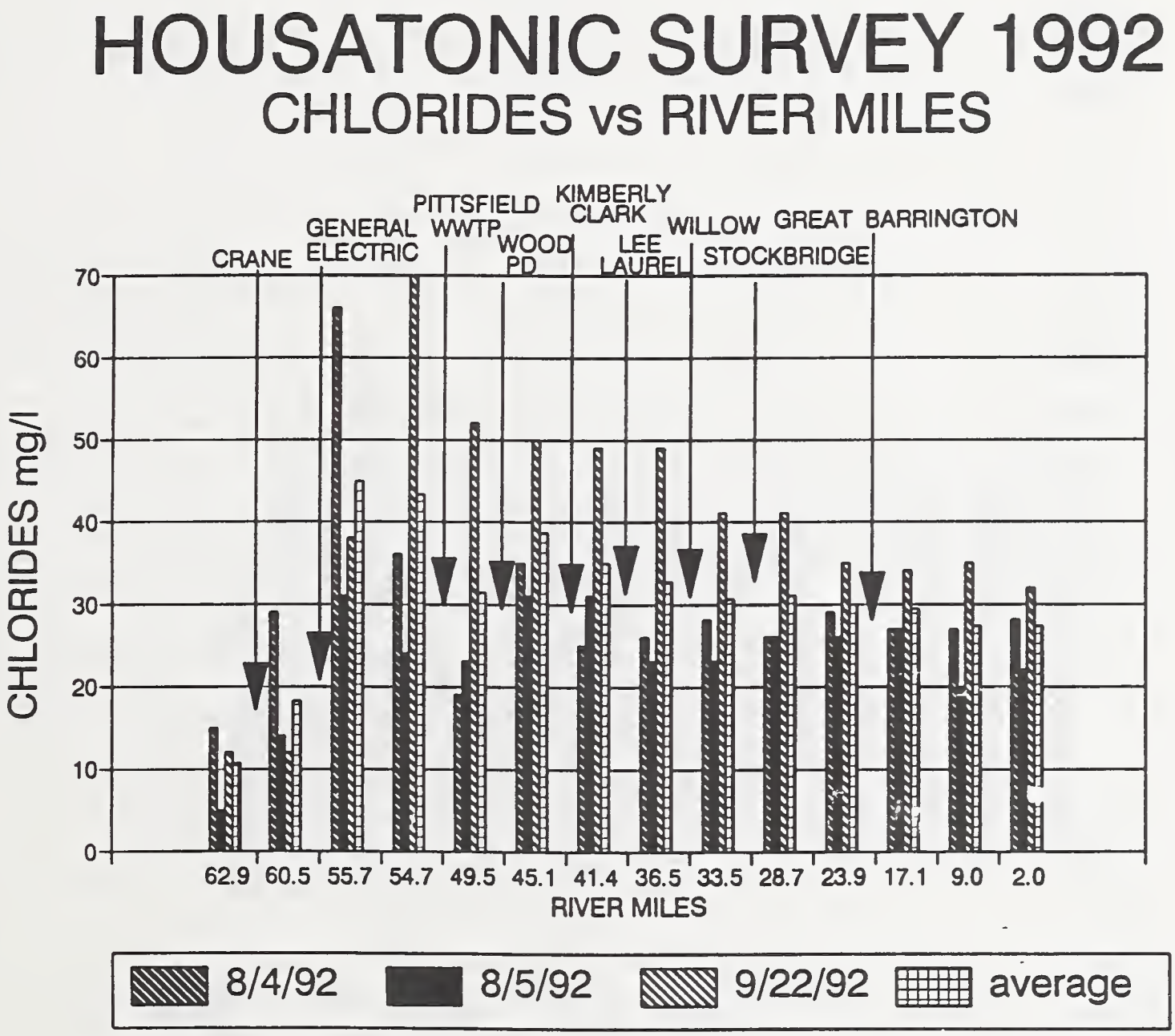

HOUSATONIC SURVEY 1992
CHLORIDES vs RIVER MILES
CRANE
GENERAL ELECTRIC
PITTSFIELD WWTP
WOOD PD
KIMBERLY CLARK
LEE LAUREL
WILLOW
GREAT BARRINGTON
STOCKBRIDGE
CHLORIDES mg/l
70
60
50
40
30
20
10
0
62.9 60.5 55.7 54.7 49.5 45.1 41.4 36.5 33.5 28.7 23.9 17.1 9.0 2.0
RIVER MILES
8/4/92
8/5/92
9/22/92
average

TABLE 13

1992 HOUSATONIC RIVER SURVEY

ALKALINITY (mg/l)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
		MAINSTEM			
HS04	62.9	113	51	84	69
HS06	60.5	113	71	130	105
HS10	55.7	128	98	142	368
HS11	54.7	110	95	131	112
HS12	49.5	101	93	121	105
HS14	45.1	89	94	117	100
HS16A	41.4	100	104	114	106
HS17A	36.5	101	96	117	105
HS18A	33.5	94	90	117	100
HS19A	28.7	98	102	115	105
HS22	23.9	102	100	118	107
HS24	17.1	105	103	120	109
HS26	9.0	103	99	122	108
HS27	2.0	110	93	121	108
		TRIBUTARIES			
WB02		85	82	101	89
WB04		111	98	140	116
GP01		68	69	71	69
HB01		97	75	103	92
KR01		115	60	122	99

Figure 12

HOUSATONIC SURVEY 1992

ALKALINITY vs RIVER MILES

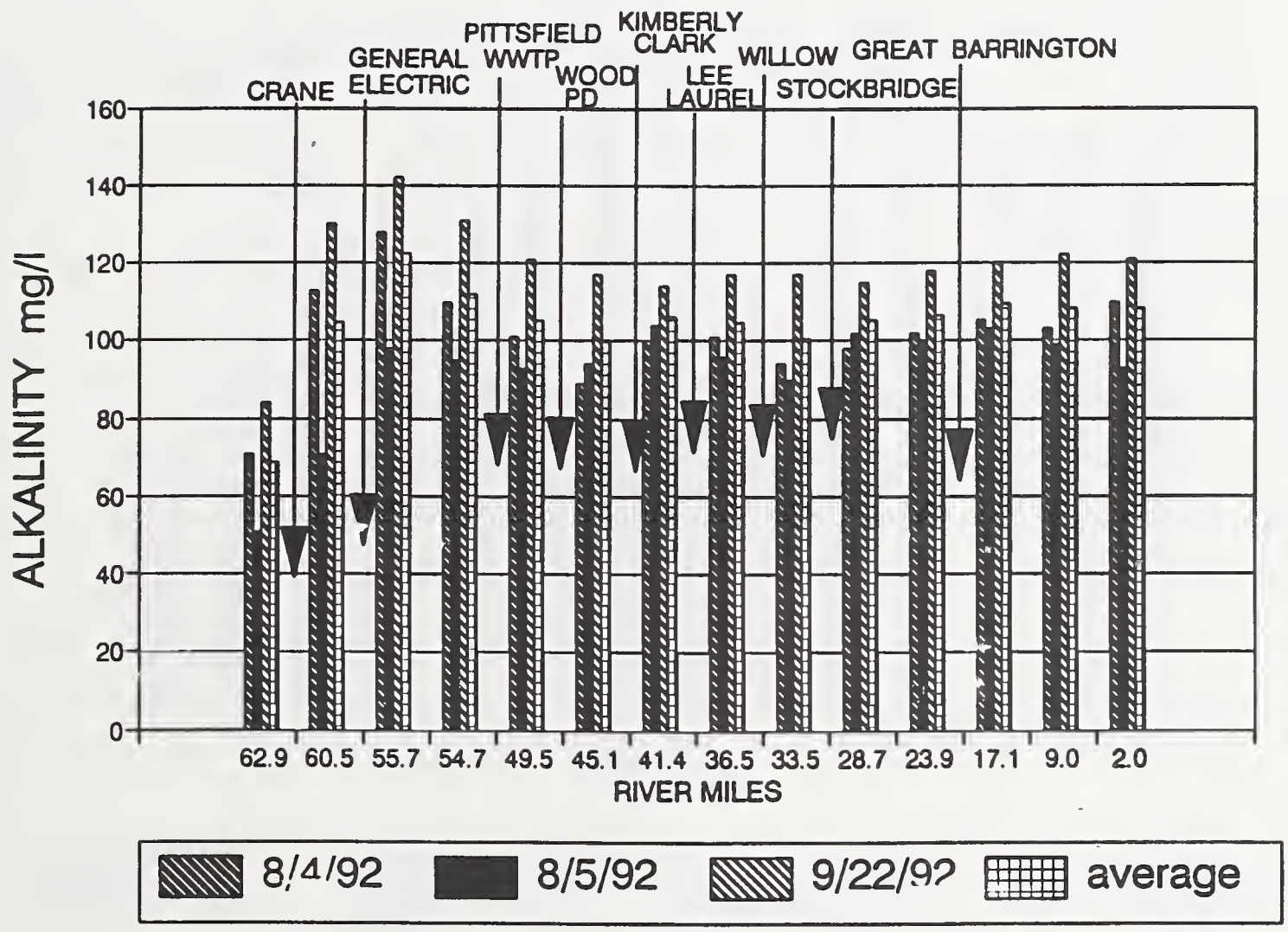


TABLE 14

1992 HOUSATONIC RIVER SURVEY

HARDNESS (mg/l)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
		MAINSTEM			
HS04	62.9	84	53	78	72
HS06	60.5	119	74	110	101
HS10	55.7	171	88	142	134
HS11	54.7	163	72	131	122
HS12	49.5	114	91	188	131
HS14	45.1	175	96	107	126
HS16A	41.4	199	109	147	152
HS17A	36.5	178	101	97	125
HS18A	33.5	175	106	107	129
HS19A	28.7	170	114	101	128
HS22	23.9	193	115	105	138
HS24	17.1	199	187	116	167
HS26	9.0	166	190	106	154
HS27	2.0	189	178	107	158
		TRIBUTARIES			
WB02		110	79	101	97
WB04		182	107	120	136
GP01		93	72	83	83
HB01		105	91	92	96
KR01		-	65	140	103

Figure 13

HOUSATONIC SURVEY 1992

HARDNESS vs RIVER MILES

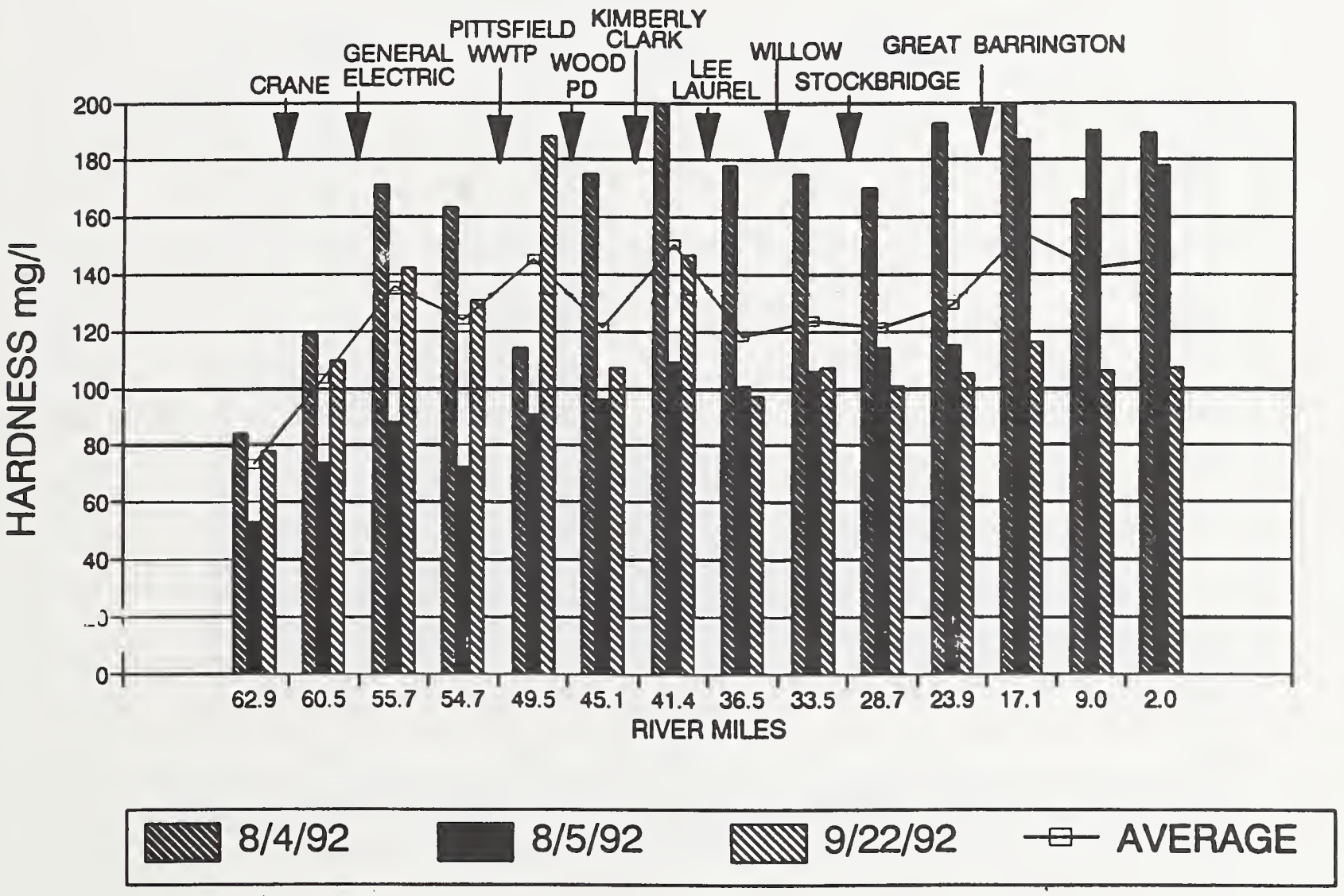


TABLE 15

1992 HOUSATONIC RIVER SURVEY

TURBIDITY (NTU)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	3-DAY AVERAGE
		MAINSTEM			
HS04	62.9	1.2	3.8	2.0	2.3
HS06	60.5	1.7	4.0	1.9	2.5
HS10	55.7	1.5	4.1	4.2	3.3
HS11	54.7	1.2	3.8	3.0	2.7
HS12	49.5	2.5	5.1	1.8	3.0
HS14	45.1	3.0	6.8	2.6	4.0
HS16A	41.4	1.4	2.8	2.8	2.6
HS17A	36.5	3.3	2.7	2.1	2.4
HS18A	33.5	-	1.4	2.0	1.6
HS19A	28.7	3.3	2.1	1.7	2.3
HS22	23.9	1.2	2.9	1.6	1.9
HS24	17.1	1.7	1.1	1.9	1.6
HS26	9.0	-	1.8	3.6	2.4
HS27	2.0	-	1.1	2.1	1.4
		TRIBUTARIES			
WB02		2.2	4.0	2.0	2.7
WB04		1.2	2.6	1.4	1.7
GP01		1.7	1.3	0.6	1.2
HB01		1.1	4.2	2.4	2.5
KR01		0.7	10.0	1.2	4.0

Figure 14

HOUSATONIC SURVEY 1992
TURBIDITY vs RIVER MILES

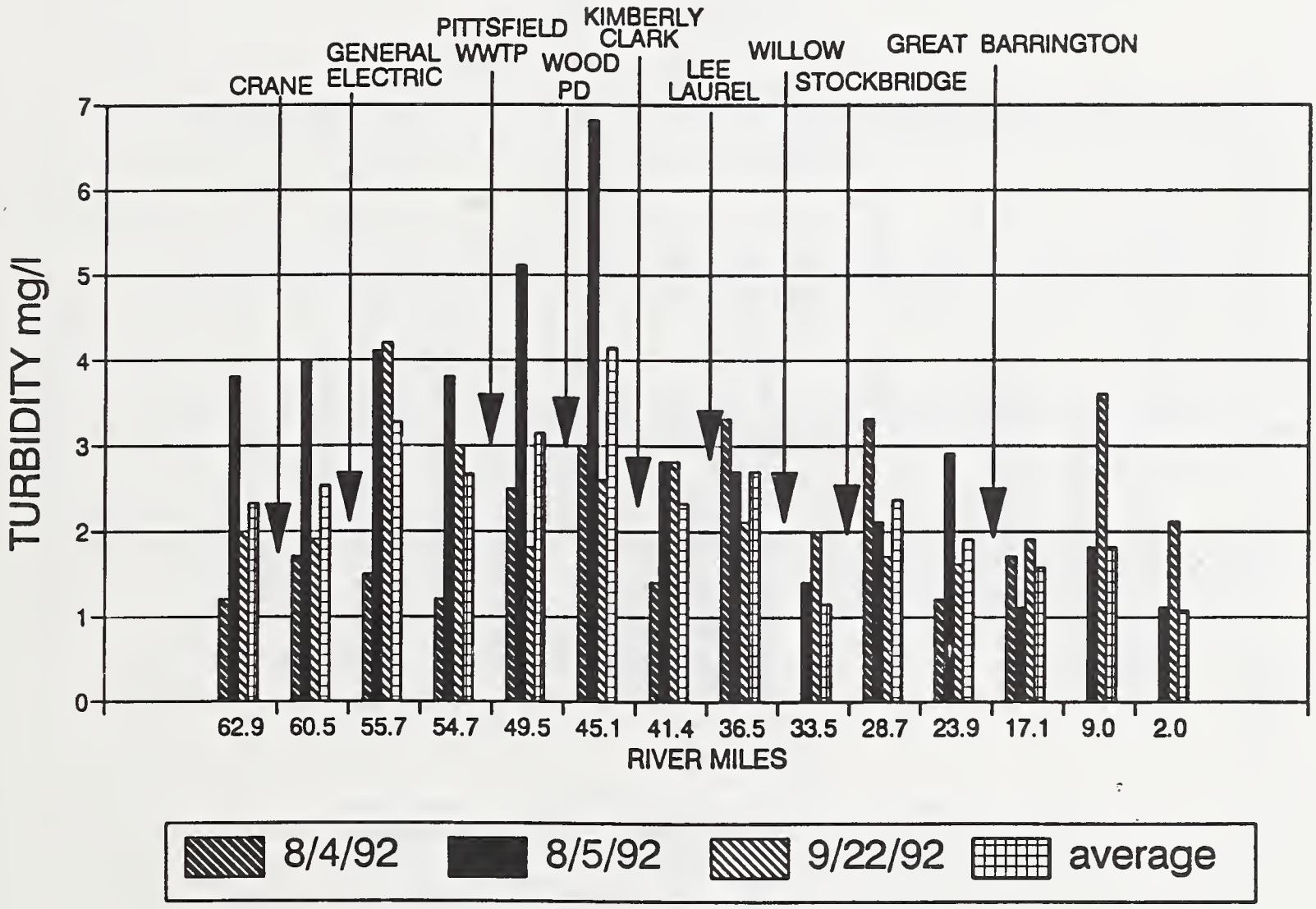


TABLE 16

1992 HOUSATONIC RIVER SURVEY

FECAL COLIFORM (col./100 ml)

STATION NUMBER	MILE POINT	8/4/92	8/5/92	9/22/92	8/4-5/92-9/22/92 GEOMETRIC MEAN
			MAINSTEM		
HS04	62.9	20	2300	400	264
HS06	60.5	60	900	300	253
HS10	55.7	3240	3500	200	1314
HS11	54.7	1840	1900	600	1280
HS12	49.5	500	3100	300	775
HS14	45.1	40	400	60	99
HS16A	41.4	260	200	609	316
HS17A	36.5	200	2400	100	363
HS18A	33.5	300	1600	100	363
HS19A	28.7	160	300	200	213
HS22	23.9	160	200	200	185
HS24	17.1	940	800	300	609
HS26	9.0	380	600	200	357
HS27	2.0	40	19000	200	534
			TRIBUTARIES		
WB02		980	1600	3400	1747
WB04		760	4800	100	715
GP01		2860	100	300	441
HB01		60	1400	620	94
KR01		820	1900	950	1140

Figure 15

HOUSATONIC SURVEY 1992
FECAL COLIFORMS vs RIVER MILES

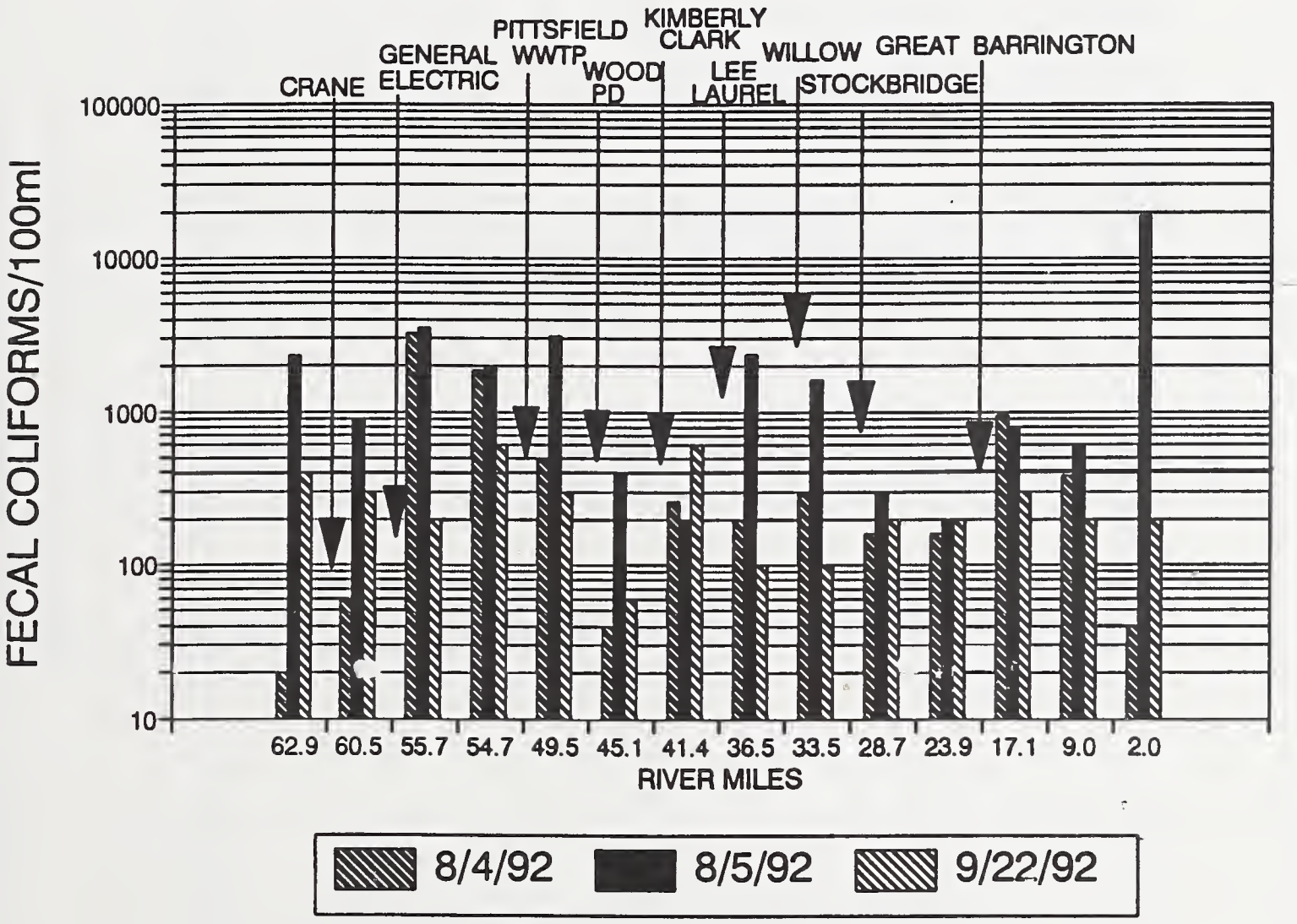


TABLE 17

1992 HOUSATONIC RIVER SURVEY

TOTAL AND DISSOLVED METALS (mg/l)*

August 4, 1992

NUMBER STATION	MILE POINT	IRON		ALUMINUM		COPPER	
		TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
HS04	62.9	0.53	0.12	0.23	<0.05	<0.03	<0.03
HS06	60.5	0.31	0.08	0.54	<0.05	<0.03	<0.03
HS10	55.7	0.42	0.12	0.08	0.08	<0.03	<0.03
HS11	54.7	0.55	0.08	0.26	<0.05	<0.03	<0.03
HS12	49.5	0.63	0.07	0.48	<0.05	<0.03	<0.03
HS14	45.1	0.16	<0.03	0.07	0.05	<0.03	<0.03
HS16A	41.4	0.29	0.03	0.05	<0.05	<0.03	<0.03
HS17A	36.5	0.35	0.12	0.17	0.06	<0.03	<0.03
HS18A	33.5	0.42	0.04	0.15	0.07	<0.03	<0.03
HS19A	28.7	0.18	0.06	0.12	<0.05	<0.03	<0.03
HS22	23.9	0.58	0.05	0.25	0.06	<0.03	<0.03
HS24	17.1	0.41	0.04	0.25	<0.05	<0.03	<0.03
HS26	9.0	0.27	<0.03	0.86	0.05	<0.03	<0.03
HS27	2.0	0.22	<0.03	0.15	0.06	0.02	<0.03
WB02		0.54	<0.03	0.15	0.06	<0.03	<0.03
WB04		0.62	0.04	0.17	<0.05	<0.03	<0.03
GP01		0.18	0.04	0.06	<0.05	<0.03	<0.03
KR01		0.16	0.09	0.005	<0.05	<0.03	<0.03
HB01		0.32	0.1	0.10	0.07	<0.03	<0.03

* All sample readings represent a composite of A.M. and P.M. runs each day.

TABLE 17 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

TOTAL AND DISSOLVED METALS (mg/l)*

August 4, 1992

NUMBER STATION	MILE POINT	NICKEL		LEAD		CHROMIUM	
		TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
HS04	62.9	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS06	60.5	<0.05	<0.05	0.05	<0.05	<0.03	<0.03
HS10	55.7	<0.05	<0.05	0.06	<0.05	<0.03	<0.03
HS11	54.7	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS12	49.5	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS14	45.1	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS16A	41.4	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS17A	36.5	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS18A	33.5	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS19A	28.7	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS22	23.9	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS24	17.1	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS26	9.0	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS27	2.0	<0.05	<0.05	<0.06	<0.05	<0.03	<0.03
WB02		<0.05	0.07	<0.05	<0.05	<0.03	<0.03
WB04		<0.05	<0.05	0.06	<0.05	<0.03	<0.03
GP01		<0.05	<0.05	0.06	<0.05	<0.03	<0.03
KR01		<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HB01		<0.05	<0.05	0.05	<0.05	<0.03	<0.03

* All sample readings represent a composite of A.M. and P.M. runs each day.

TABLE 17 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

TOTAL AND DISSOLVED METALS (mg/l)*

August 4, 1992

NUMBER STATION	MILE POINT	ZINC		CADMIUM		MERCURY		ARSENIC	
		TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
HS04	62.9	0.09	0.07	<0.02	<0.02	<0.0002	<0.0002	<0.001	0.001
HS06	60.5	<0.02	0.03	<0.02	<0.02	<0.0002	<0.0002	0.002	<0.001
HS10	55.7	0.02	0.03	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS11	54.7	0.02	0.03	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS12	49.5	<0.02	0.03	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS14	45.1	0.03	0.02	<0.02	<0.02	0.002	0.0006	<0.001	0.001
HS16A	41.4	<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS17A	36.5	<0.02	0.02	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS18A	33.5	<0.02	0.02	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS19A	28.7	0.03	0.05	<0.02	<0.02	<0.0002	0.0003	<0.001	<0.001
HS22	23.9	<0.02	0.02	<0.02	<0.02	<0.0002	<0.0002	0.003	<0.001
HS24	17.1	0.21	<0.02	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS26	9.0	<0.02	0.03	<0.02	<0.02	0.0008	<0.0002	<0.001	<0.001
HS27	2.0	0.02	0.02	<0.02	<0.02	0.0008	<0.0002	<0.001	<0.001
WB02		0.26	<0.02	<0.02	<0.02	0.0002	<0.0002	<0.001	<0.001
WB04		0.02	0.02	<0.02	<0.02	<0.0002	0.0003	<0.001	<0.001
GP01		<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
KR01		<0.02	0.05	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HB01		<0.02	0.03	<0.02	<0.02	0.0004	<0.0002	<0.001	<0.001

* All sample readings represent a composite of A.M. and P.M. runs each day.

TABLE 18

1992 HOUSATONIC RIVER SURVEY

TOTAL AND DISSOLVED METALS (mg/l)*

August 5, 1992

NUMBER STATION	MILE POINT	IRON		ALUMINUM		COPPER	
		TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
HS04	62.9	0.27	0.14	0.60	<0.05	<0.03	<0.03
HS06	60.5	0.37	0.10	0.32	0.07	<0.03	<0.03
HS10	55.7	0.53	0.10	0.17	0.09	<0.03	<0.03
HS11	54.7	0.44	0.11	0.28	<0.05	<0.03	<0.03
HS12	49.5	0.50	0.07	0.06	0.06	<0.03	<0.03
HS14	45.1	0.18	<0.03	0.05	<0.05	<0.03	<0.03
HS16A	41.4	0.47	0.08	0.34	<0.05	<0.03	<0.03
HS17A	36.5	0.34	0.06	0.30	0.08	0.02	<0.03
HS18A	33.5	0.27	0.08	0.12	<0.05	0.02	<0.03
HS19A	28.7	0.18	0.06	0.10	<0.05	<0.03	<0.03
HS22	23.9	0.33	<0.03	0.43	0.05	<0.03	<0.03
HS24	17.1	0.34	0.08	0.25	<0.05	<0.03	<0.03
HS26	9.0	0.17	<0.03	0.10	<0.05	<0.03	<0.03
HS27	2.0	0.14	0.07	<0.05	<0.05	0.02	<0.03
WB02		0.11	0.05	0.29	<0.05	<0.03	<0.03
WB04		0.59	0.06	0.20	0.07	<0.03	<0.03
GP01		0.14	0.07	<0.05	<0.05	<0.03	<0.03
KR01		2.10	0.15	1.60	<0.05	<0.03	<0.03
HB01		0.23	0.11	0.09	<0.05	<0.03	<0.03

* All sample readings represent a composite of A.M. and P.M. runs each day.

TABLE 18 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

TOTAL AND DISSOLVED METALS (mg/l)*

August 5, 1992

NUMBER STATION	MILE POINT	NICKEL		LEAD		CHROMIUM	
		TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
HS04	62.9	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS06	60.5	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS10	55.7	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS11	54.7	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS12	49.5	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS14	45.1	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS16A	41.4	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS17A	36.5	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS18A	33.5	<0.05	<0.05	<0.05	0.06	<0.03	<0.03
HS19A	28.7	<0.05	<0.05	0.06	<0.05	<0.03	<0.03
HS22	23.9	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS24	17.1	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HS26	9.0	<0.05	<0.05	0.05	<0.05	<0.03	<0.03
HS27	2.0	<0.05	<0.05	0.09	<0.05	<0.03	<0.03
WB02		<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
WB04		<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
GP01		<0.05	<0.05	<0.05	<0.05	<0.03	0.03
KR01		<0.05	<0.05	<0.05	<0.05	<0.03	<0.03
HB01		<0.05	<0.05	<0.05	<0.05	<0.03	<0.03

TABLE 18 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

TOTAL AND DISSOLVED METALS (mg/l)*

August 5, 1992

NUMBER STATION	MILE POINT	ZINC		CADMIUM		MERCURY		ARSENIC	
		TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
HS04	62.0	0.02	0.03	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS06	60.5	0.02	0.02	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS10	55.7	0.07	0.03	<0.02	<0.02	<0.0002	0.0003	<0.001	<0.001
HS11	54.7	0.15	0.08	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS12	49.5	0.02	0.02	<0.02	<0.02	<0.0002	0.0003	<0.001	<0.001
HS14	45.1	<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS16A	41.4	0.04	0.03	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS17A	36.5	0.02	0.02	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS18A	33.5	0.03	0.02	<0.02	<0.02	0.0006	<0.0002	<0.001	<0.001
HS19A	28.7	0.02	0.02	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
HS22	23.9	0.02	0.25	<0.02	<0.02	<0.002	<0.0002	0.002	0.003
HS24	17.1	0.06	<0.06	<0.02	<0.02	<0.002	<0.0002	<0.001	<0.001
HS26	9.0	0.02	<0.02	<0.02	<0.02	0.0008	<0.0002	<0.001	0.001
HS27	2.0	0.02	<0.02	<0.02	<0.02	0.0008	<0.0002	<0.001	<0.001
WB02		<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
WB04		0.02	0.03	<0.02	<0.02	<0.0002	<0.0002	<0.001	<0.001
GP01		0.05	<0.02	<0.02	<0.02	0.0002	<0.0002	0.003	<0.001
KR01		0.02	0.11	<0.02	<0.02	0.0002	<0.0002	0.003	<0.001
HB01		0.02	0.02	<0.02	<0.02	0.0005	<0.0002	<0.001	<0.001

TABLE 19

1992 HOUSATONIC RIVER SURVEY

TOTAL AND DISSOLVED METALS (mg/l)*

September 22, 1992

NUMBER STATION	MILE POINT	IRON		ALUMINUM		COPPER	
		TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
HS04	62.9	0.45	-	0.13	-	<0.002	-
HS06	60.5	0.29	-	0.19	-	<0.002	-
HS10	55.7	0.44	0.18	0.13	<0.05	<0.002	<0.002
HS11	54.7	0.44	0.11	0.17	<0.05	<0.002	<0.002
HS12	49.5	0.41	0.07	0.16	<0.05	0.004	<0.002
HS14	45.1	0.40	0.03	0.10	<0.05	<0.002	<0.002
HS16A	41.4	0.50	0.06	0.09	<0.05	<0.002	<0.002
HS17A	36.5	0.40	-	0.12	-	<0.002	-
HS18A	33.5	0.32	-	0.21	-	0.12	-
HS19A	28.7	0.19	-	0.10	-	0.007	-
HS22	23.9	0.20	-	0.06	-	0.006	-
HS24	17.1	0.27	-	0.11	-	<0.002	-
HS26	9.0	0.30	0.29	0.08	<0.05	0.006	<0.002
HS27	2.0	0.35	0.06	0.08	<0.05	<0.002	<0.002
WE02		0.32	-	0.06	-	0.009	-
WB04		0.21	-	0.08	-	<0.002	-
GP01		0.15	-	0.05	-	0.004	-
KR01		0.21	-	0.06	-	<0.002	-
HB01		-	-	-	-	-	-

- Sample not taken
* All sample readings represent a composite of A.M. and P.M. runs each day.

TABLE 19 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

TOTAL AND DISSOLVED METALS (mg/l)*

September 22, 1992

NUMBER STATION	MILE POINT	NICKEL		LEAD		CHROMIUM	
		TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
HS04	62.9	0.008	-	0.007	-	0.007	-
HS06	60.5	0.004	-	0.003	-	0.006	-
HS10	55.7	<0.002	<0.002	0.008	0.002	0.005	0.007
HS11	54.7	0.004	<0.002	0.014	0.001	0.005	0.004
HS12	49.5	0.008	<0.002	0.007	0.001	0.007	0.003
HS14	45.1	0.004	<0.002	0.005	<0.001	0.005	0.002
HS16A	41.4	0.006	<0.002	0.007	<0.001	0.006	0.002
HS17A	36.5	0.007	-	0.007	-	0.009	-
HS18A	33.5	0.015	-	<0.001	-	0.007	-
HS19A	28.7	0.004	-	0.006	-	0.006	-
HS22	23.9	<0.002	-	0.004	-	0.004	-
HS24	17.1	<0.002	-	0.003	-	0.004	-
HS26	9.0	<0.002	<0.002	0.002	0.001	0.003	0.003
HS27	2.0	<0.002	<0.002	0.002	<0.001	0.003	<0.001
WB02		0.01	0.011	-	-	0.007	-
WB04		0.009	-	0.005	-	0.006	-
GP01		0.006	-	0.022	-	0.007	-
KR01		0.009	-	0.022	-	0.008	-
HB01		-	-	-	-	-	-

TABLE 19 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

TOTAL AND DISSOLVED METALS (mg/l)*

September 22, 1992

NUMBER STATION	MILE POINT	ZINC		CADMIUM		MERCURY		ARSENIC	
		TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
HS04	62.9	0.07	-	<0.001	-	0.0002	-	0.003	-
HS06	60.5	0.07	-	<0.001	-	<0.0002	-	0.005	-
HS10	55.7	0.07	0.04	<0.001	<0.001	<0.0002	<0.0002	0.004	<0.001
HS11	54.7	0.07	0.03	<0.001	<0.001	0.0002	0.0002	0.002	<0.001
HS12	49.5	0.07	0.04	<0.001	<0.001	0.0002	<0.0002	0.003	<0.001
HS14	45.1	0.07	0.03	<0.001	<0.001	0.0002	0.0002	<0.001	<0.001
HS16A	41.4	0.02	0.02	<0.001	<0.001	0.0002	0.002	<0.001	<0.001
HS17A	36.5	0.02	-	<0.001	-	<0.0002	-	<0.001	-
HS18A	33.5	0.02	-	0.008	-	<0.0002	-	<0.001	-
HS19A	28.7	0.06	-	<0.001	-	<0.0002	-	<0.001	-
HS22	23.9	0.04	-	<0.001	-	<0.0002	-	<0.001	-
HS24	17.1	0.03	-	<0.001	-	<0.0002	-	<0.001	-
HS26	9.0	0.03	0.03	<0.001	<0.001	<0.0002	<0.0002	<0.001	<0.001
HS27	2.0	0.03	0.02	<0.001	<0.001	<0.0002	<0.0002	<0.001	<0.001
WB02		0.03	-	<0.001	-	<0.0002	-	<0.001	-
GP01		0.02	-	0.003	-	<0.0002	-	<0.001	-
KR01		0.02	-	<0.001	-	<0.0002	-	<0.001	-
HB01		-	-	<0.001	-	<0.0002	-	<0.001	-

TABLE 20

1992 HOUSATONIC RIVER SURVEY

GAS CHROMATOGRAPHY - MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS (µg/l)

LAB NUMBER	STATION NUMBER	LOCATION	DATE SAMPLED	ORGANIC DETECTED	LEVEL (µg/l)
92-1312	General Electric	Pittsfield	8/4/92	Dibromochloromethane Bromoform	26 38
92-1313	HS06	Pittsfield	8/4/92	None	-
92-1311	HS11	Pittsfield	8/4/92	None	-
92-1315	HS18A	Stockbridge	8/4/92	None	-
92-1314	HS24	Gr. Barrington	8/4/92	None	-
92-1374	General Electric	Pittsfield	8/5/92	Bromodichloromethane Dibromochloromethane Bromoform	12 31 70
92-1378	HS06	Pittsfield	8/5/92	None	-
92-1378A	HS11	Pittsfield	8/5/92	None	-
92-1377	HS18A	Stockbridge	8/5/92	None	-
92-1376	HS24	Gr. Barrington	8/5/92	None	-

TABLE 21

1992 HOUSATONIC RIVER SURVEY

CHLOROPHYLL ANALYSIS/ALGAE IDENTIFICATIONS

LAKE LILLINONAH, CONNECTICUT

During the summer of 1992, the U.S. EPA collected samples for chlorophyll analysis from Lake Lillinonah, Connecticut for chlorophyll a and phosphorus analysis. Algae identifications were done as well. Three samples were collected on each sampling date: August 5, August 19 and September 2.

August 5, 1992

Station LLLN01 was dominated by colonial blue green; both Microcystis flos aqua as well as Microcystis aeruginosa were present in addition to the filamentous bluegreen algae, Anabaena, Nostoc and Aphanizomenon.

The sample appearance was bright green from algal growth. The chlorphyll a values were extremely high: 202.7 mg/m^3 and a duplicate of 235 mg/m^3.

Station LLLN02 was also dominated by bluegreens and had a chlorophyll a value of 35.3 mg/m^3.

Station LLLN03 was also dominated by bluegreens and had a chlorophyll a value of 21.6 mg/m^3.

August 19, 1992

This sample date followed a large rain event which may have affected the sampling results. U.S. EPA field personnel recalled that Station LLLN01 had little visible algal mass on this date. The chlorophyll a value reflects this since it was only 2.8 mg/m^3. A notation was made that the filter was brown, possibly from stirred up sediment.

The sample from LLLN02 was still dominated by the colonial coccoid bluegreens listed above; some greens such as Scenedesmus and an unidentified single cell coccoid were also found. The chlorophyll a filter was green and the chlorophyll a values were 21.6 and the duplicate 24.5 mg/m^3.

At Station LLLN03, the bluegreen coccoids remained dominant. Also found in the sample were the diatom Fragilaria as well as Scenedesmus and another green Elaktothrix. The chlorophyll a value was 12.7 mg/m^3.

September 2, 1992

On this sampling date Station LLLN01 was dominated by green algae, a natural switch in dominance as the weather cools and the light intensity decreases. In particular, Scenedesmus, Dictyosphaerium and Micractinium were isolated. Also, an unidentified golden-brown was also recovered here. The chlorophyll a value was 19.6 mg/m^3.

Station LLLN03 was dominated by the bluegreen coccoids Microcystis aeruginosa and Microcystis flos aqua. The filamentous blue green Lyngbya was also recovered. The chlorophyll a value here was 46.0 mg/m^3.

The algal assemblage as well as the elevated chlorophyll a values at Lake Lillinonah are indications of eutrohic conditions at this lake.

TABLE 22

1992 HOUSATONIC RIVER SURVEY

FLOW DATA*

(Average Daily Flow in CFS)

GAGING STATION	STREAM	RIVER MILE	AUG 4	AUG 5	SEPT 22
Coltsville (Station HS06)	E. Br. Housatonic	60.5	60	80	43
Great Barrington	Housatonic	23.9	194	338	125

TABLE 23**

1992 HOUSATONIC RIVER SURVEY

RAINFALL DATA (Inches)

DATE	PITTSFIELD	GREAT BARRINGTON
August 2	0	0
August 3	0	0
August 4	0	0
August 5	0.88	1.82
September 20	0	0
September 21	0	0
September 22	1.18	1.21

*** Source - Personnel (Russ Gadoury; Tom Shepard) at the U.S. Geological Survey Offices in Marlborough, MA - Water Resources Data for Massachusetts Water Year 1992**

**** Source - U.S. NOAA Monthly Climatolgical Report for August, September 1992**

TABLE 24

1992 HOUSATONIC RIVER SURVEY

COMPARISON OF AVERAGE* DATA FROM 1978, 1985, 1992 SURVEYS
(Results in mg/l, except where noted)

STATION	MILE POINT	Dissolved Oxygen			Ammonia Nitrogen			BOD_5			Fecal Coliform[1]		
		1978	1985	1992	1978	1985	1992	1978	1985	1992	1978	1985	1992
HS04	62.9	7.9	8.0	8.4	0.02	0.02	0.03	1.6	-	2.8	90	116	264
HS06	60.5	6.9	8.2	8.0	0.01	0.05	0.05	8.5	4.8	2.6	195	684	253
HS10	55.7	5.4	6.9	7.3	0.09	0.21	0.19	5.4	2.8	3.4	315	462	1314
HS11	54.7	6.3	7.1	7.3	0.06	0.43	0.12	3.2	2.6	2.5	465	456	1280
HS12	49.5	6.7	7.3	7.4	0.09	0.25	0.12	2.2	3.8	2.6	95	326	775
HS14	45.1	14.0	9.3	9.8	0.04	0.11	0.04	6.2	4.1	3.3	1500	43	99
HS16A	41.4	7.2	8.0	7.6	0.02	0.03	0.05	4.5	4.7	3.3	995	262	146
HS17A	36.5	8.5	6.9	7.4	0.03	0.24	0.11	3.9	4.1	2.8	390	150	363
HS18A	33.5	8.2	-	7.6	-	-	0.08	-	-	3.1	-	-	363
HS19A	28.7	9.0	10.9	7.7	0.02	0.09	0.04	5.3	4.3	2.3	610	163	213
HS22	23.9	8.4	8.0	8.3	0.03	0.08	0.03	6.0	4.6	2.8	175	95	212
HS24	17.1	8.6	8.4	8.1	0.03	0.12	0.05	5.2	4.2	3.0	435	116	609
HS26	9.0	8.9	8.6	8.1	0.02	0.09	0.03	5.7	3.7	2.0	390	80	357
HS27	2.0	10.2	9.7	8.4	0.02	0.08	0.03	6.2	4.0	2.0	105	29	534
WB02		7.9	7.5	8.1	0.01	0.42	0.04	-	2.4	2.6	-	619	1747
WB04		-	7.8	8.1	-	0.14	0.05	-	2.8	1.8	-	380	715
GP01		8.5	-	8.7	0.09	-	0.03	2.2		1.9	625	-	441
KR01		-	9.2	7.4	-	0.07	0.02	-	1.8	1.7	-	310	94
HB01		7.5	7.2	8.7	0.02	0.07	0.02	2.2	1.7	2.2	400	140	1140

* 1978 An average of 4 days: 6/27; 6/29; 8/22; 8/24 1985 An average of 3 days: 6/26; 7/23; 7/24
1992 An average of 3 days: 8/4; 8/5; 9/22

- Sample not taken

[1] Figures for each year represent the geometric mean of all survey samples in that year. Samples represent colonies/per 100 ml.

TABLE 24 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

COMPARISON OF AVERAGE* DATA FROM 1978, 1985, 1992 SURVEYS
(Results in mg/l, except where noted)

STATION	MILE POINT	Phosphorus			Nitrate Nitrogen			Kjeldahl Nitrogen			Suspended Solids		
		1978	1985	1992	1978	1985	1992	1978	1985	1992	1978	1985	1992
HS04	62.9	0.05	0.03	<0.04	0.1	0.1	0.1	0.58	0.44	0.43	3.1	5.0	3.3
HS06	60.5	0.06	0.05	<0.03	0.2	0.1	0.2	1.60	0.69	0.94	6.7	5.0	4.0
HS10	55.7	0.14	0.07	<0.05	0.2	0.1	0.3	1.03	0.78	0.84	6.5	7.2	8.2
HS11	54.7	0.10	0.05	0.06	0.2	0.2	0.3	0.86	0.79	0.59	6.7	8.2	7.3
HS12	49.5	0.25	0.24	0.16	1.3	4.2	2.5	0.99	1.50	0.55	10.0	8.2	6.3
HS14	45.1	0.18	0.18	0.09	0.4	0.9	1.2	1.15	1.10	0.78	15.0	10.0	6.0
HS16A	41.4	0.19	0.30	0.10	0.7	0.9	1.1	1.00	1.67	0.57	12.5	10.2	8.3
HS17A	36.5	0.15	0.25	0.12	0.6	0.7	1.1	0.88	1.86	0.71	8.9	10.2	8.0
HS18A	33.5	-	-	0.09	-	-	1.1	-	-	0.77	-	-	9.4
HS19A	28.7	0.15	0.21	0.07	0.4	0.7	1.0	1.00	1.76	0.67	8.9	7.1	4.8
HS22	23.9	0.15	0.18	0.11	0.4	0.5	1.0	1.15	1.30	0.66	15.0	14.0	15.3
HS24	17.1	0.14	0.16	0.09	0.2	0.4	0.9	0.98	1.90	0.64	14.5	10.5	13.0
HS26	9.0	0.15	0.13	0.06	0.2	0.2	0.8	1.09	1.50	0.55	18.5	12.1	8.8
HS27	2.0	0.11	0.13	0.06	0.2	0.2	0.7	0.98	1.76	0.53	15.0	12.3	6.6
WB02		-	0.08	<0.03	-	0.5	0.2	-	1.20	0.60	-	11.0	13.0
WB04		-	0.04	<0.03	-	0.2	0.3	-	0.75	0.43	-	8.0	10.7
GP01		0.04	-	<0.03	0.3	0.4	0.1	0.70	-	0.24	8.2	-	4.5
KR01		-	0.06	<0.03	-	-	0.1	-	1.05	0.37	-	4.0	3.9
HB01		0.04	0.06	<0.03	0.1	0.2	0.3	0.55	1.03	0.39	5.2	1.2	41.3

TABLE 24 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

COMPARISON OF AVERAGE* DATA FROM 1978, 1985, 1992 SURVEYS
(Results in mg/l, except where noted)

STATION	MILE POINT	Total Solids			Alkalinity/Hardness					pH			Chlorides		
		1978	1985	1992	1978	1985		1992		1978	1985	1992	1978	1985	1992
						A	A	A	H						
HS04	62.9	158	-	121	85	-	-	-	72	7.8	7.9	7.1	11	-	11
HS05	60.5	225	200	227	91	96	123	69	101	7.8	7.9	7.5	15	14	18
HS10	55.7	258	240	289	104	115	133	105	134	7.9	7.7	7.4	-	35	45
HS11	54.7	233	260	233	106	127	146	368	122	7.9	7.8	7.4	24	32	43
HS12	49.5	225	270	240	106	114	150	112	131	8.0	7.8	7.3	24	27	31
HS14	45.1	249	250	229	97	109	128	105	126	8.4	8.4	7.8	18	25	42
HS16A	41.4	250	270	248	103	119	134	100	152	8.1	8.0	7.4	19	28	35
HS17A	36.5	242	240	244	102	113	129	106	125	8.2	8.0	7.5	19	25	33
HS18A	33.5	-	-	224	-	-	-	105	179	-	-	7.4	-	-	31
HS19A	28.7	259	240	223	106	112	133	100	118	8.2	8.3	7.6	19	24	31
HS22	23.9	282	280	251	104	123	129	105	138	8.1	8.2	7.5	18	32	30
HS24	17.1	272	275	235	115	121	142	107	167	8.2	8.1	7.7	20	25	29
HS26	9.0	261	260	214	110	121	136	109	154	8.1	8.3	7.7	17	22	27
HS27	2.0	248	250	205	109	119	141	108	158	8.1	8.3	7.9	16	21	27
WB02		-	240	170	-	93	105	89	97	-	8.0	7.4	-	14	16
WB04		-	240	200	-	90	173	116	136	-	7.9	7.5	-	20	22
GP01		82	-	151	-	-	-	69	83	8.0	-	7.4	6	-	22
KR01		-	195	147	-	121	139	92	96	-	8.2	7.6	-	5	10
HB01		81	185	272	-	94	101	99	103	8.0	8.2	7.0	5	15	6

TABLE 24 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

COMPARISON OF AVERAGE DATA 1978, 1985, 1992 SURVEYS
Results in (NTU) Units

STATION	MILE POINT	Turbidity 1978	1985	1992
HS04	62.9	1.9	-	2.3
HS06	60.4	3.2	4.2	2.5
HS10	55.7	3.3	3.4	3.3
HS11	54.7	2.7	3.1	2.7
HS12	49.5	3.9	5.5	3.0
HS14	45.1	3.2	5.5	4.0
HS16A	41.4	2.8	4.2	2.4
HS17A	36.5	2.4	3.7	1.6
HS18A	33.5	-	-	2.3
HS19A	28.7	3.3	4.3	1.9
HS22	23.9	2.[illegible]	4.6	1.6
HS24	17.1	3.2	5.6	2.4
HS26	9.0	3.8	4.9	1.4
HS27	2.0	3.5	5.6	1.4
WB02		-	-	2.7
WB04		-	-	1.7
GP01		1.7	-	1.2
KR01		-	-	2.5
HB01		2.8	-	4.0

FIGURE 16

HOUSATONIC SURVEYS COMPARISON

DISSOLVED OXYGEN vs RIVER MILES

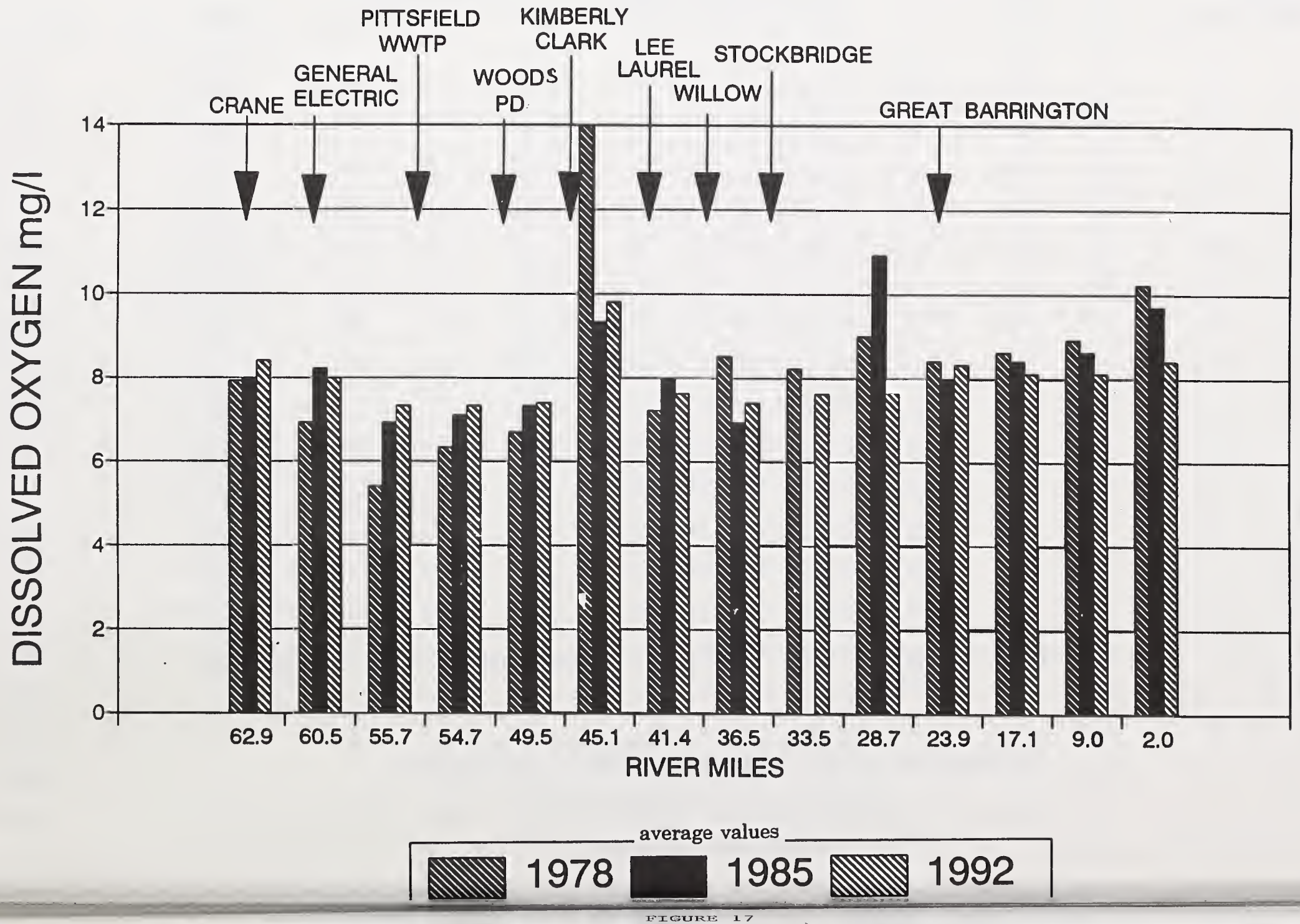


FIGURE 17

FIGURE 17

HOUSATONIC SURVEYS COMPARISON

BOD_5 vs RIVER MILES

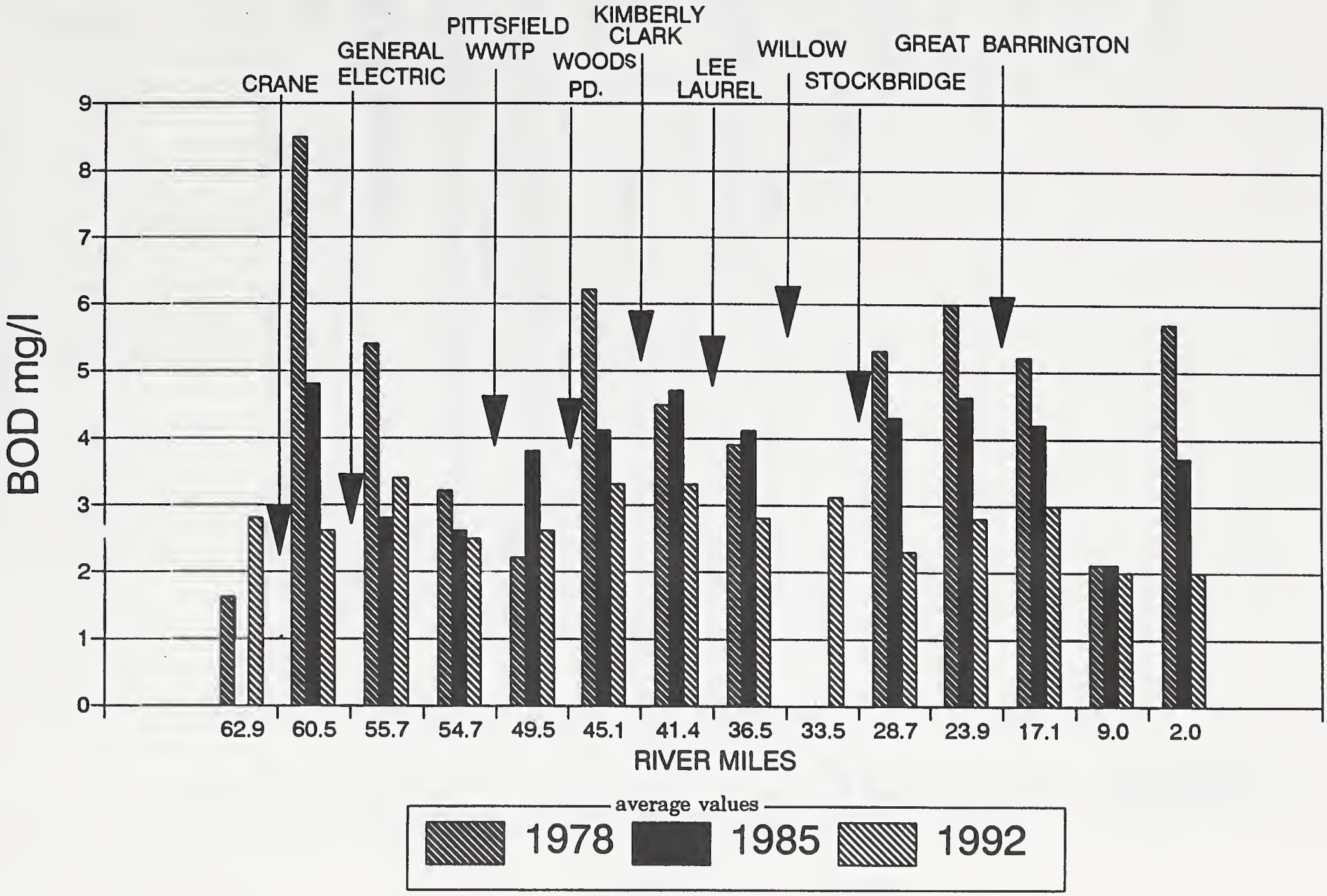


FIGURE 18

HOUSATONIC SURVEY 1992

AMMONIA-N vs RIVER MILES

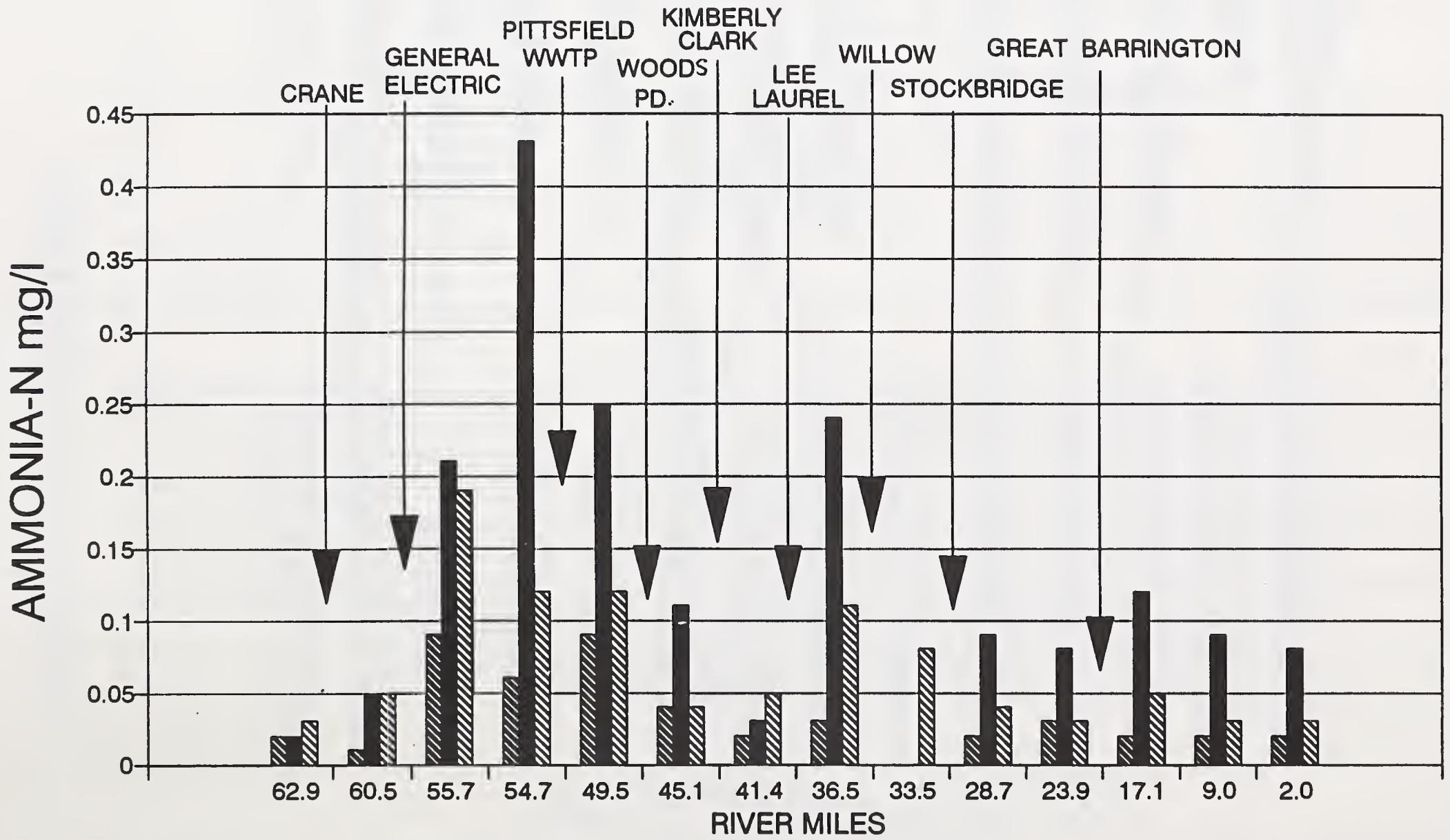


FIGURE 19

HOUSATONIC SURVEYS COMPARISON

NITRATE-N vs RIVER MILES

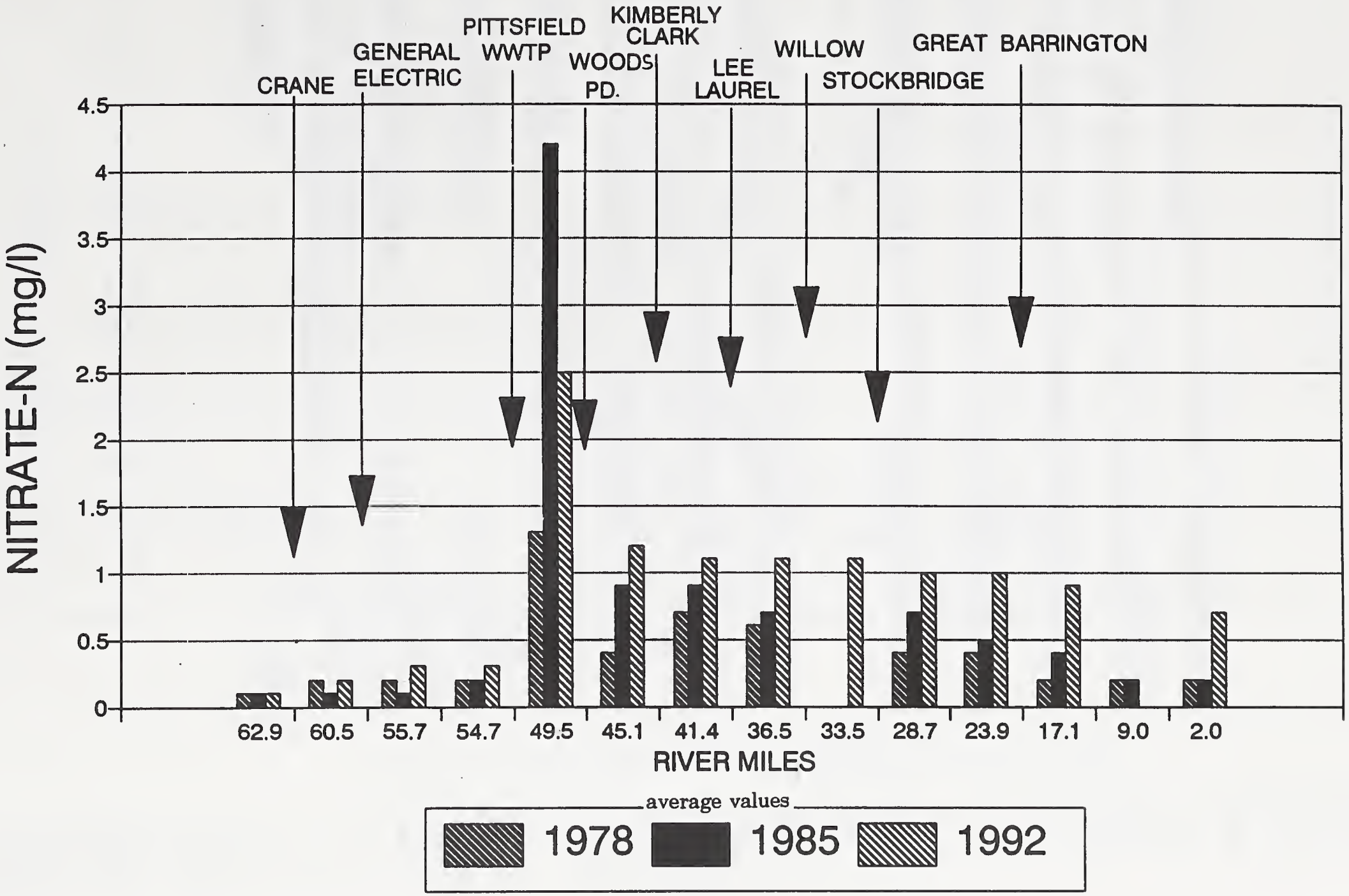


FIGURE 20

HOUSATONIC SURVEYS COMPARISON

KJELDAHL N vs RIVER MILES

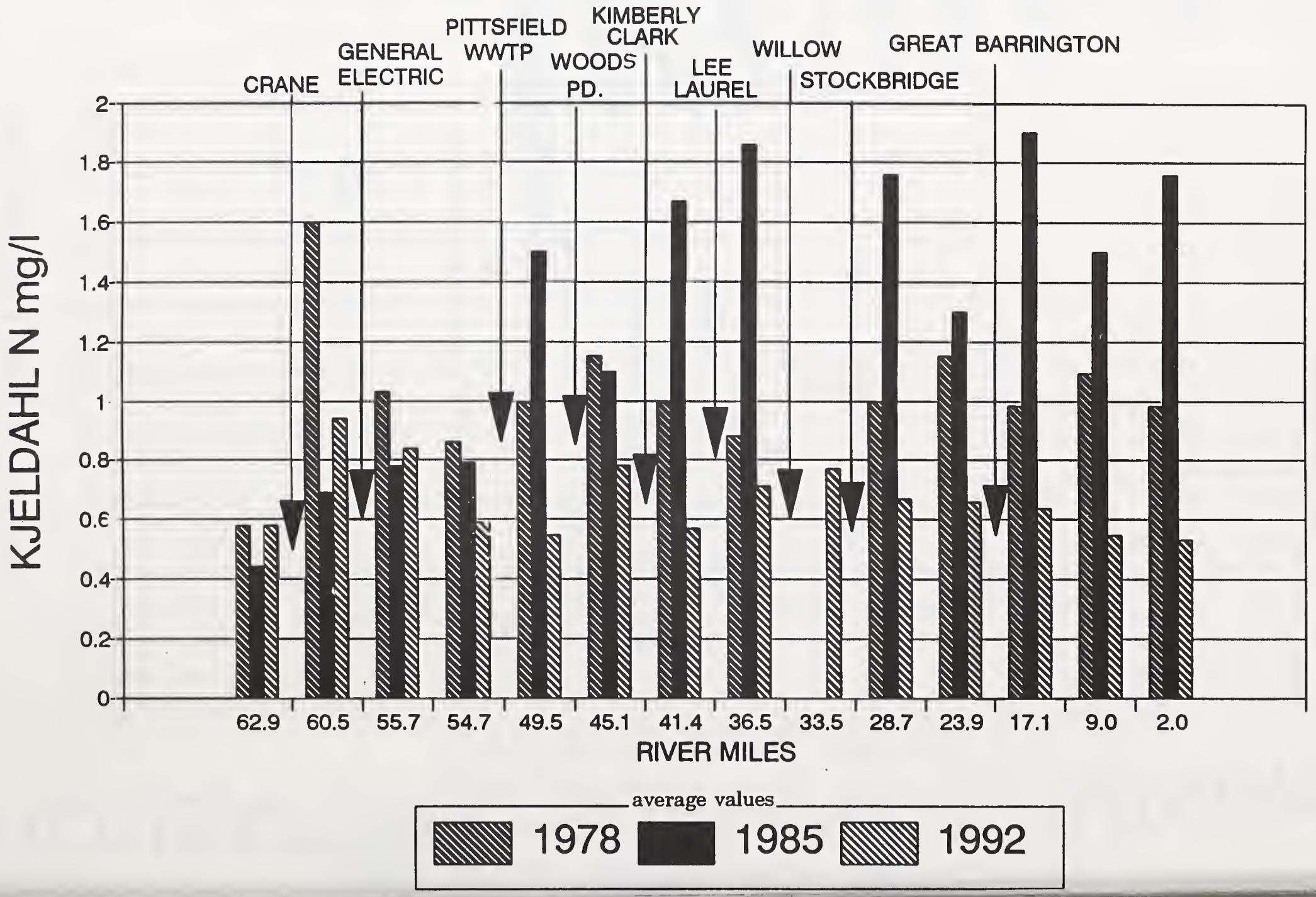


FIGURE 21

FIGURE 21

HOUSATONIC SURVEYS COMPARISON

PHOSPHORUS vs RIVER MILES

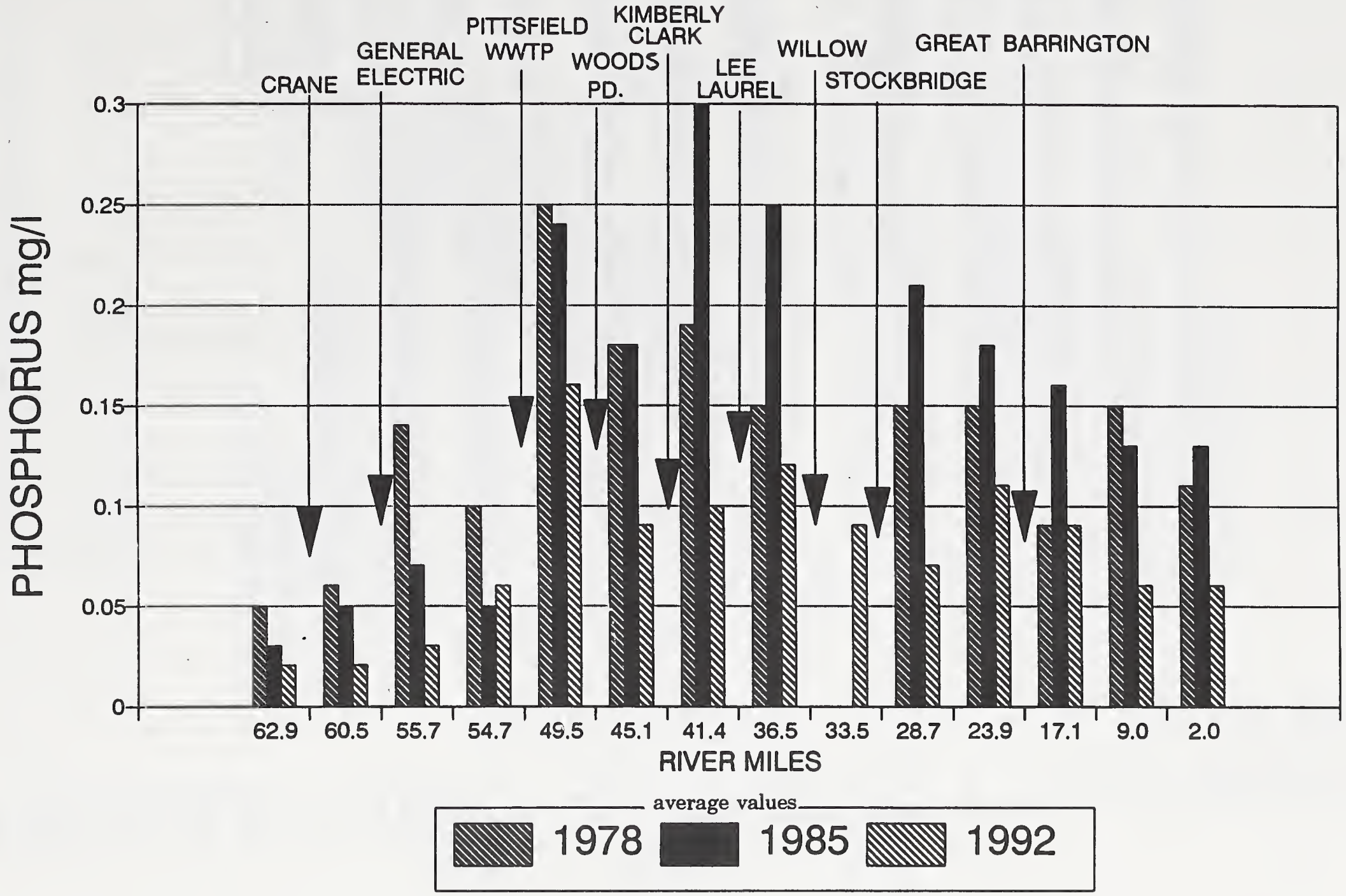


FIGURE 22

HOUSATONIC SURVEYS COMPARISON
SUSPENDED SOLIDS vs RIVER MILES

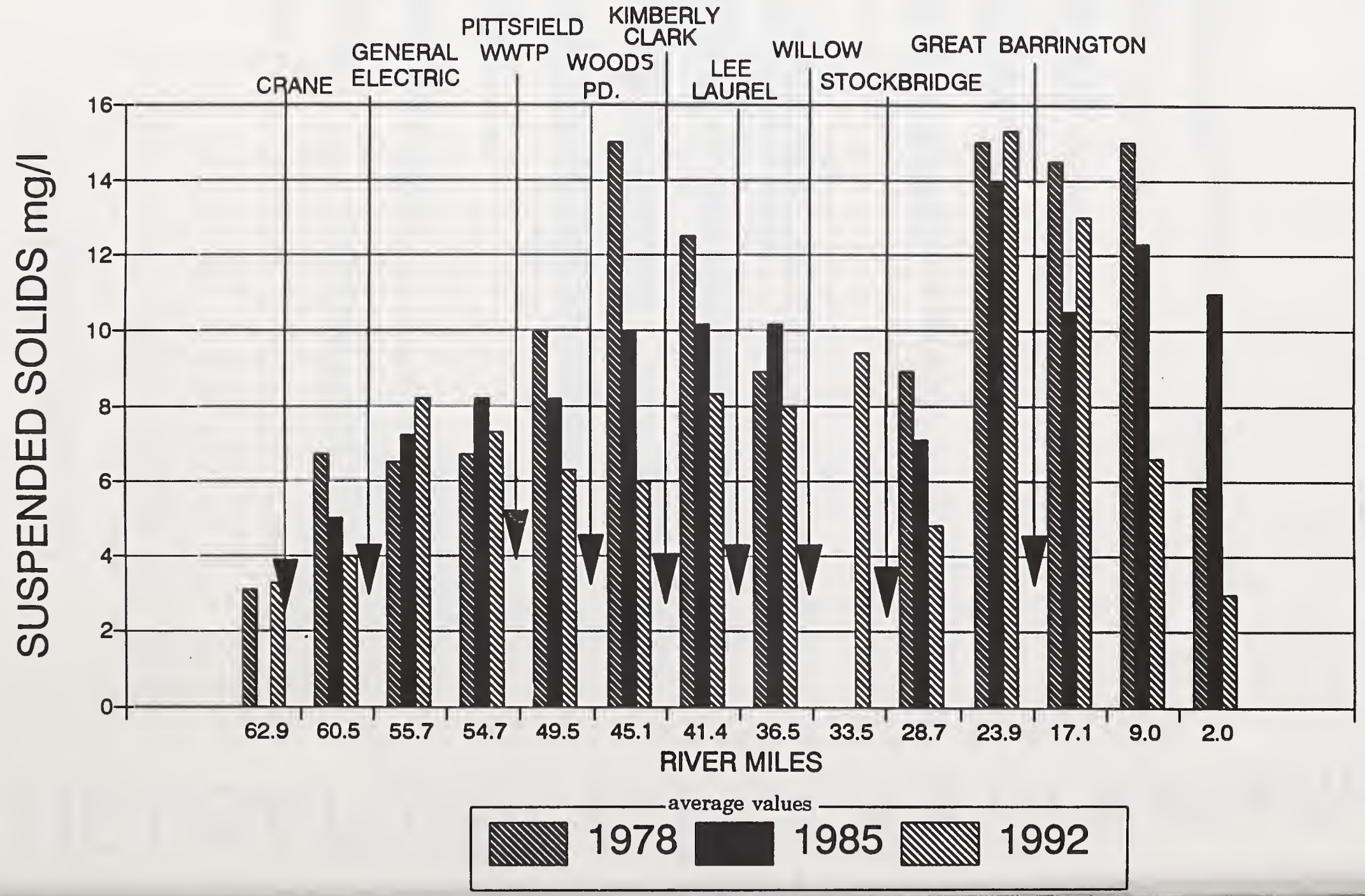


FIGURE 23

FIGURE 23

HOUSATONIC SURVEYS COMPARISON

TOTAL SOLIDS vs RIVER MILES

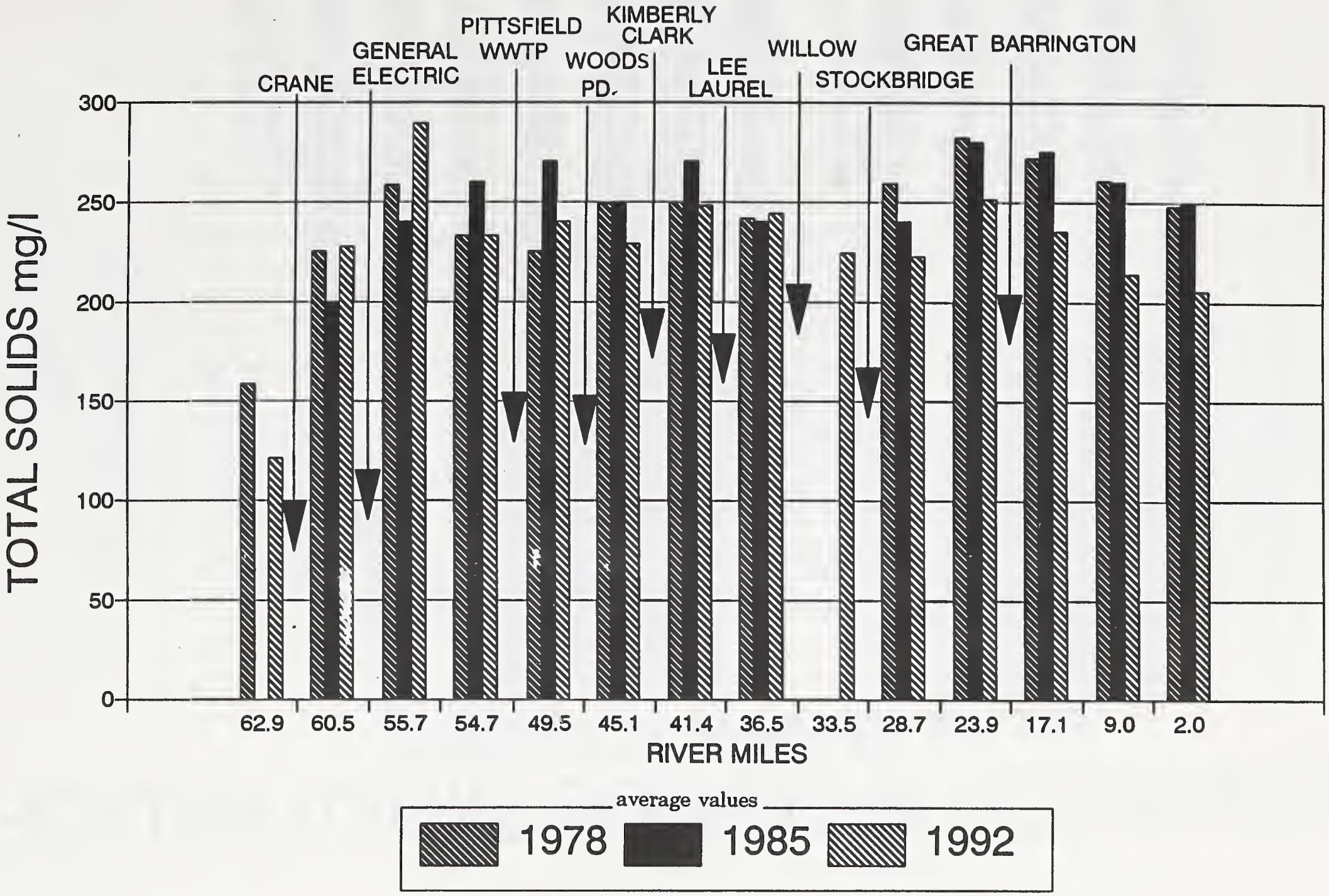


FIGURE 24

HOUSATONIC SURVEYS COMPARISON

TURBIDITY vs RIVER MILES

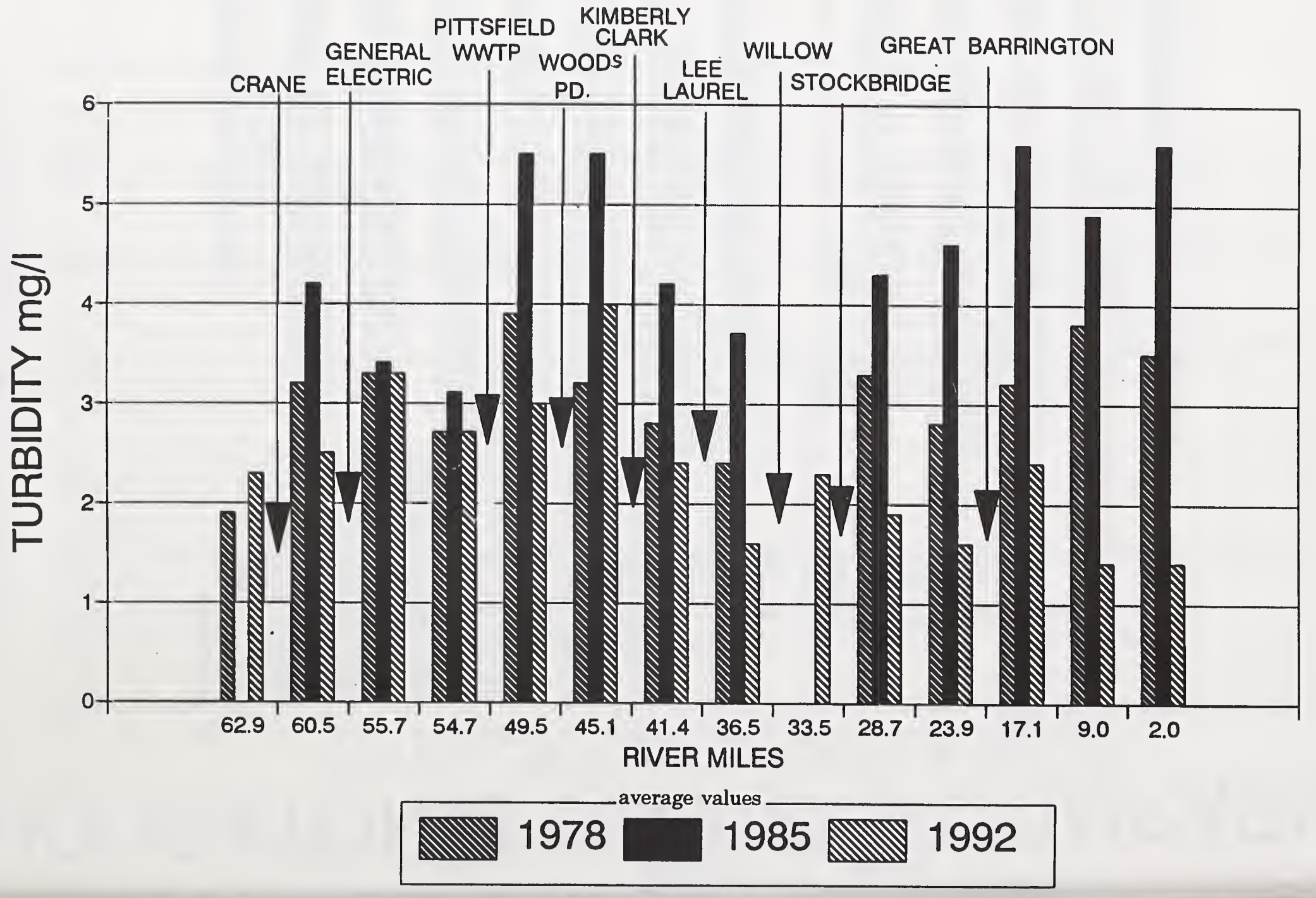


FIGURE 25

HOUSATONIC SURVEYS COMPARISON

CHLORIDES vs RIVER MILES

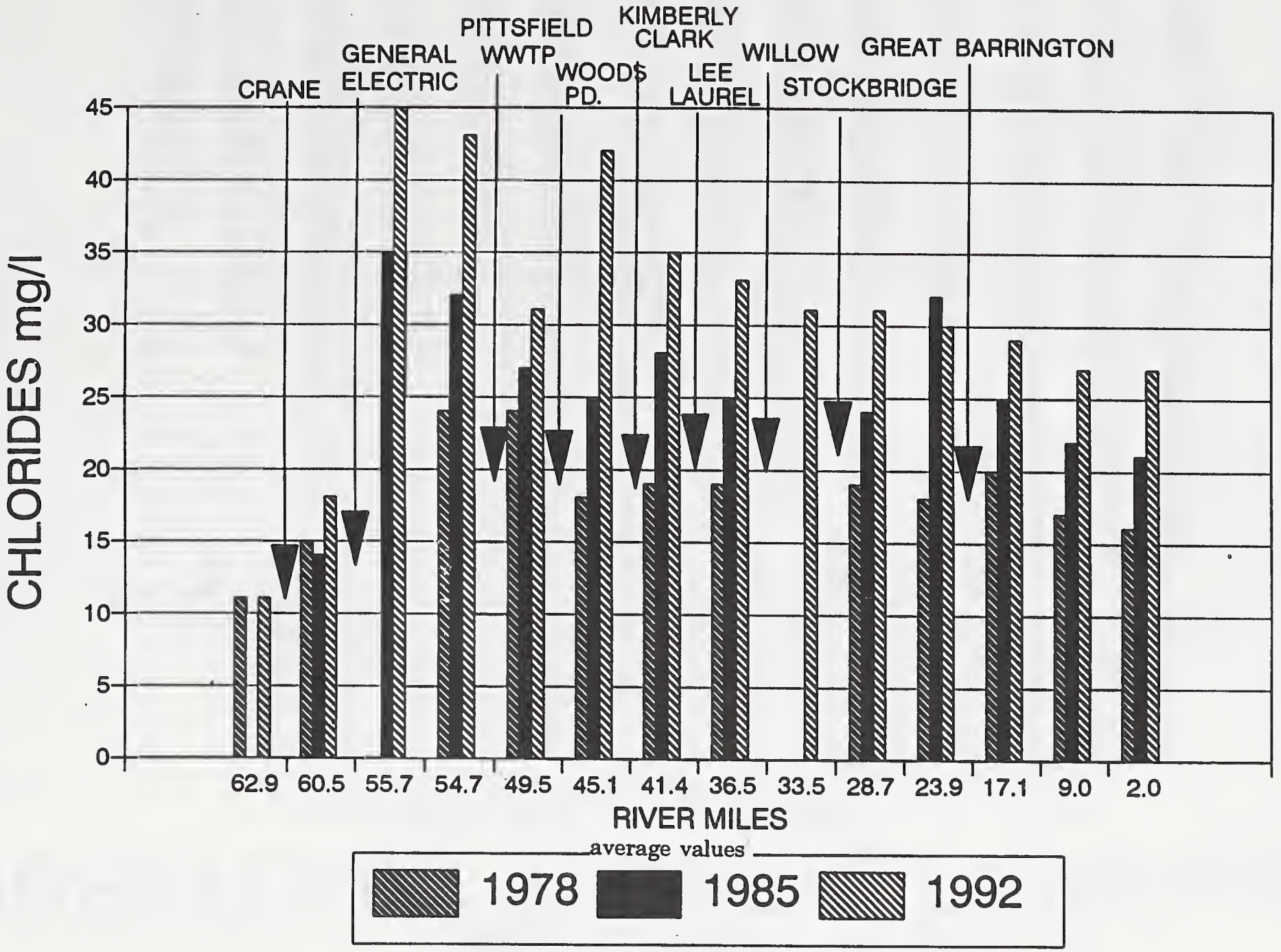


FIGURE 26

HOUSATONIC SURVEYS COMPARISON

HARDNESS vs RIVER MILES

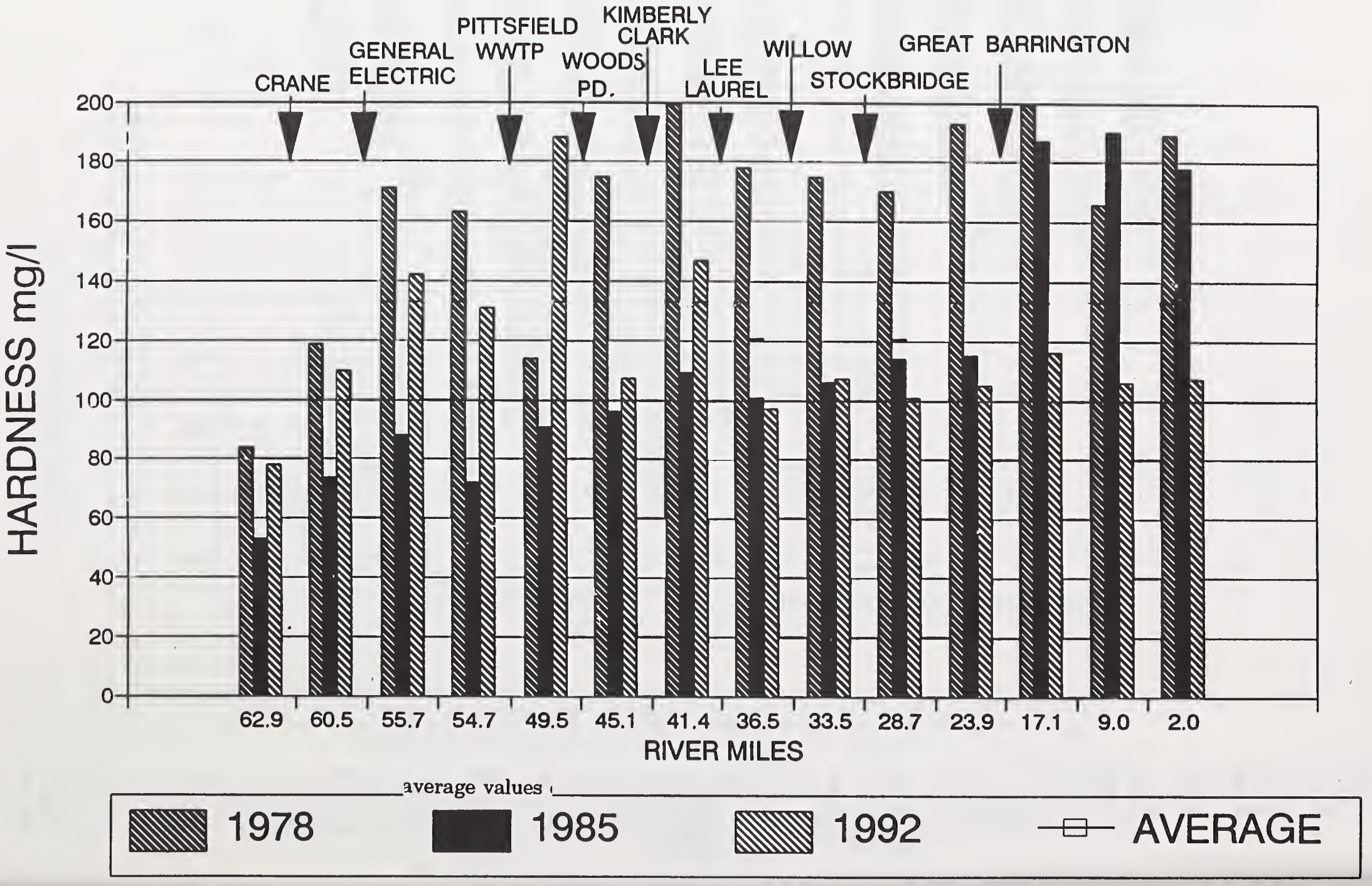


FIGURE 27

FIGURE 27

HOUSATONIC SURVEYS COMPARISON

FECAL COLIFORMS vs RIVER MILES

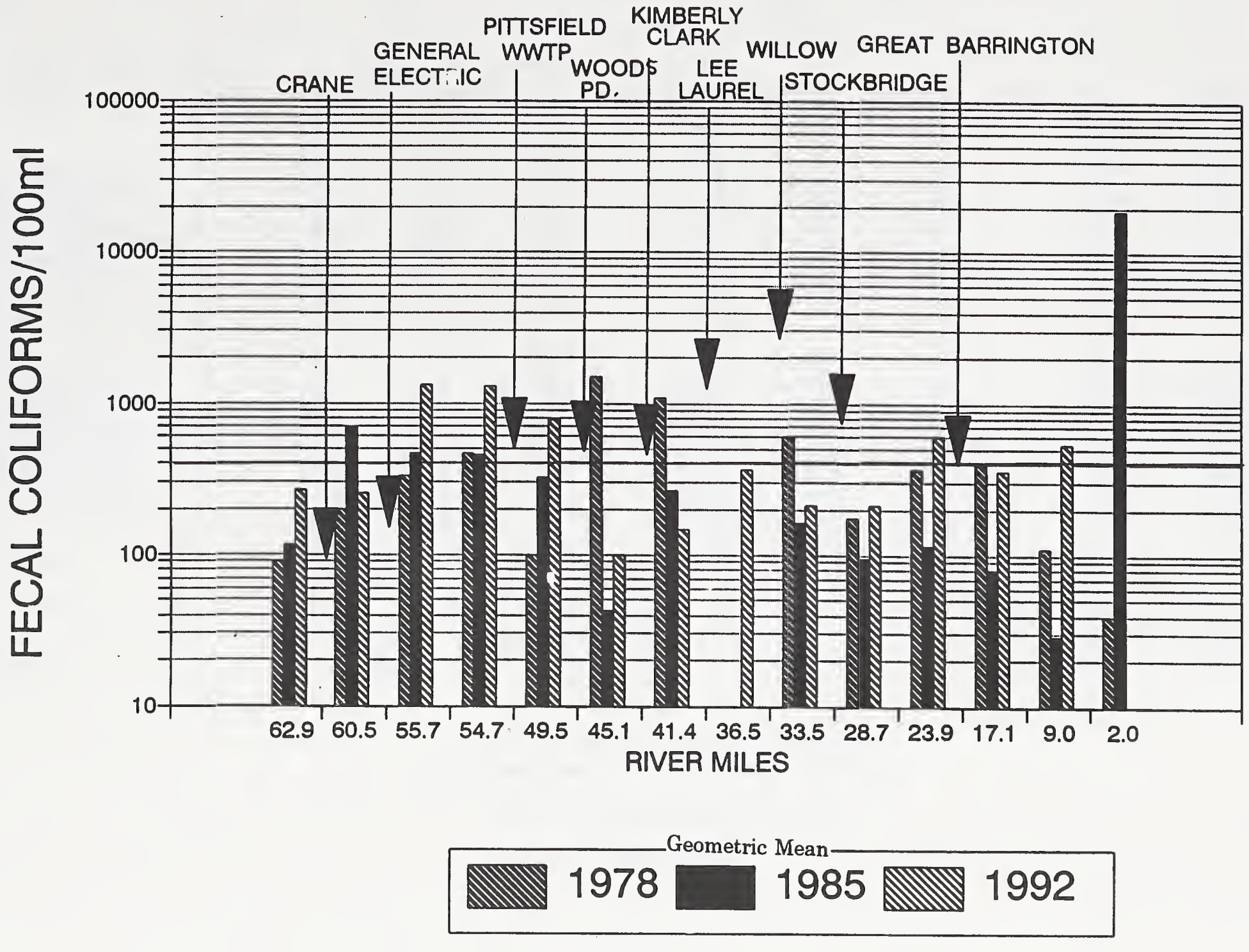


TABLE 25

1992 HOUSATONIC RIVER SURVEY

1992 INSTREAM LOADINGS DATA - MAINSTEM
(All parameter results in lbs/day)

STATION:	HS04			HS06			HS10		
DATE:	8/4	8/5	9/22	8/4	8/5	9/22	8/4	8/5	9/22
Parameter									
Flow (cfs)	54	54	39.5	60	60	43	73	89	50
BOD_5	610	782	701	678	968	624	1,178	1,867	888
TKN	96	169	81	258	268	278	309	349	269
Nitrate Nitrogen	99	222	46	207	419	94	205	463	235
Ammonia Nitrogen	8.7	8.7	4.3	16.1	12.9	11.6	71	57.5	75.3
Phosphorus	14.5	<8.7	<6.4	<9.7	<9.7	<6.9	35.3	14.4	<8.1
Suspended Solids	8,716	2,034	<212	1,614	2,098	<231	2,945	6,703	673
Total Solids	38,348	28,471	28,476	78,763	47,129	124,931	128,033	42,614	88,232
Chlorides	4,357	1,452	4,952	9,361	4,519	2,776	2,592	14,843	10,222
Metals*									
Iron (Total)	154	78	95	100	118	67	165	208	118
Iron (Dissolved)	35	41	-	25	32	-	46	39	48
Aluminum (Total)	67	174	28	173	103	44	31	66	35
Aluminum (Dissolved)	14	<15	-	16	22	-	31	35	<13
Lead (Total)	<14	<14	1	14	<15	1	17	<19	<1
Zinc (Total)	26	6	15	<6	<6	16	<6	27	19
Zinc (Dissolved)	20	9	-	9	12	12			

* Only Iron, Aluminum, Lead (Tot.) and Zinc are calculated. Copper, Chromium, Lead (Diss.), Cadmium, Mercury, and Arsenic Samples were largely, or completely below MDL.

TABLE 25 (Continued)

1992 HOUSATONIC RIVER SURVEY

1992 INSTREAM LOADINGS DATA - MAINSTEM
(All parameter results in lbs/day)

STATION:	HS12			HS14			HS16A		
DATE:	8/4	8/5	9/22	8/4	8/5	9/22	8/4	8/5	9/22
Parameter									
Flow (cfs)	86	140	70	110	160	78	132	229	85
BOD_5	972	2,260	1,017	2,308	3,099	1,007	2,130	4,435	1,509
TKN	254	437	196	402	775	319	355	801	256
Nitrate Nitrogen	879	979	1,619	539	697	797	781	1,971	777
Ammonia Nitrogen	64.8	75.3	41.4	<11.8	34.4	33.6	35.5	98.6	<9.1
Phosphorus	92.5	60.3	71.6	35.5	68.9	50.4	63.9	135.5	45.7
Suspended Solids	2,313	9,038	753	2,959	8,177	1,469	5,326	16,016	2,058
Total Solids	111,968	155,159	109,967	120,727	173,881	118,338	161,916	280,900	131,702
Chlorides	8,970	17,324	19,583	20,713	43,040	20,982	17,754	38,193	22,408
Metals*									
Iron (Total)	291	376	154	93	155	168	205	579	229
Iron (Dissolved)	32	53	26	<33	<25	13	22	99	27
Aluminum (Total)	221	45	60	84	43	41	37	418	41
Aluminum (Dissolved)	<36	45	19	29	<43	<20	<37	61	<23
Lead (Total)	<22	<23	2	<20	<17	<2	<34	62	3
Zinc (Total)	<6	15	26	17	<17	27	<14	49	9
Zinc (Dissolved)	9	15	11	11	<17	10	<14	30	9

TABLE 25 (Continued)

1992 HOUSATONIC RIVER SURVEY

1992 INSTREAM LOADINGS DATA - MAINSTEM
(All parameter results in lbs/day)

STATION:	HS18A			HS19A			HS22		
DATE:	8/4	8/5	9/22	8/4	8/5	9/22	8/4	8/5	9/22
Parameter									
Flow (cfs)	160	278	103	183	319	118	194	338	125
BOD_5	-	4,936	1,496	1,772	5,149	1,333	2,192	7,092	1,614
TKN	705	972	454	807	909	400	805	1,091	370
Nitrate Nitrogen	792	1,495	720	876	1,527	768	1,043	1,418	807
Ammonia Nitrogen	68.9	74.8	61	39.4	120.1	12.7	41.7	72.7	13.5
Phosphorus	68.9	164.5	55.4	68.9	103	57	114.8	255	53.8
Suspended Solids	6,456	28,417	831	5,907	6,892	952	6,262	143,656	2,354
Total Solids	166,995	311,093	149,617	196,908	384,443	156,170	233,793	505,526	168,125
Chlorides	24,102	34,399	22,719	25,598	44,621	26,028	30,268	47,279	23,537
Metals*									
Iron (Total)	361	404	177	178	309	121	603	609	135
Iron (Dissolved)	35	120	-	57	103	-	50	55	-
Aluminum (Total)	130	179	116	115	172	63	291	782	40
Aluminum (Dissolved)	59	75	-	52	<86	-	61	39	-
Lead (Total)	<41	<75	<1	<47	103	4	<50	<90	<3
Zinc (Total)	<17	45	11	29	34	38	21	36	27
Zinc (Dissolved)	17	30	-	41	34	-	<20	450	-

TABLE 25 (Continued)

1992 HOUSATONIC RIVER SURVEY

1992 INSTREAM LOADINGS DATA - MAINSTEM
(All parameter results in lbs/day)

STATION:	HS24			HS27		
DATE:	8/4	8/5	9/22	8/4	8/5	9/22
Parameter						
Flow (cfs)	271	473	175	310	567	210
BOD_5	3,499	8,397	3,107	3,502	7,321	1,895
TKN	991	1,756	508	833	1,830	520
Nitrate Nitrogen	1,399	2,086	1,035	1,334	2,440	746
Ammonia Nitrogen	29.2	41.4	113	<33	<61	45.2
Phosphorus	131	229	75.3	83.4	244	56.5
Suspended Solids	14,599	58,529	5,649	9,673	33,555	3,389
Total Solids	321,731	590,380	233,492	336,895	567,385	255,335
Chlorides	39,365	68,708	32,011	46,698	97,614	36,153
Metals*						
Iron (Total)	597	865	254	367	427	395
Iron (Dissolved)	60	203	-	46	213	68
Aluminum (Total)	365	636	104	1,170	<152	90
Aluminum (Dissolved)	<70	634	-	66	<152	<50
Lead (Total)	<70	127	<3	80	274	<3
Zinc (Total)	306	152	28	61	61	34
Zinc (Dissolved)	<29	152	-	61	<61	<20

TABLE 26

1992 HOUSATONIC RIVER SURVEY

1992 INSTREAM LOADING DATA (Average)*
(All results in lbs/day except were noted)

STATION:	HS04	HS06	HS10	HS12	HS14	HS16A	HS18A	HS19A	HS22	HS24	HS27
PARAMETER											
Flow (cfs)	49	54	71	99	116	149	180	207	219	306	362
BOD_5	728	757	1,311	1,416	2,138	2,691	3,216	2,751	3,633	5,001	4,173
TKN	115	268	309	296	499	471	710	705	755	1,085	1,078
Nitrate Nitrogen	122	240	301	1,159	678	1,176	1,002	1,057	1,089	1,507	1,507
Ammonia Nitrogen	7	13.5	68	61	27	48	68	57	43	61	46
Phosphorus	11	<9	19.2	75	52	82	96	76	141	145	128
Suspended Solids	1,039	1,314	3,440	4,035	4,201	7,800	11,901	4,583	50,804	26,242	15,539
Total Solids	31,765	83,607	86,293	125,698	137,649	191,500	209,235	245,823	302,433	383,333	386,533
Chlorides	3,587	5,552	9,219	15,232	28,245	26,118	27,073	32,082	3,695	46,700	60,133
Metals											
Iron (Total)	109	95	164	272	139	268	314	203	441	572	396
Iron (Dissolved)	38	28	44	37	<23	49	78	81	52	88	109
Aluminum (Total)	90	107	44	109	56	165	142	117	371	368	<471
Aluminum (Dissolved)	14	19	<25	33	<30	<40	66	<66	50	<350	<89
Lead (Total	<14	<14	<9	<15	<9	<33	<39	<51	<43	<67	119
Zinc (Total)	16	<6	<17	<16	<20	<24	<21	34	27	162	51
Zinc (Dissolved)	10	<6	11	13	<12	<17	24	37	157	<60	<48

* Based on average flows, loadings for 8/4, 8/5, 9/22.

TABLE 27

1992 HOUSATONIC RIVER SURVEY

COMPARISON OF AVERAGE LOADINGS 1978, 1985, 1992 SURVEYS
(All parameter loadings in lbs/day)

STATION:	HS06			HS10			HS12		
YEAR:	1978	1985	1992	1978	1985	1992	1978	1985	1992
Parameter									
Flow (cfs)	31	14.6	54	41	19.8	71	86	40.5	99
BOD_5	1,418	377	757	1,911	298	1,311	2,784	827	1,416
TKN	267	54	268	227	83	309	458	327	296
Nitrate Nitrogen	33	8	240	47	11	301	601	23	1,159
Ammonia Nitrogen	2	4	14	20	22	68	42	54	61
Phosphorus	10	4	<9	31	7	19	116	52	75
Suspended Solids	1,117	393	1,314	1,434	767	3,440	4,627	1,786	4,035
Total Solids	37,525	15,710	83,607	56,909	25,565	86,293	104,103	58,830	125,698
Chlorides	2,335	1,100	5,552	36,395	3,728	9,219	11,104	5,883	15,232
Metals[1]									
Aluminum (Total)	-	<8	107	-	<8	44	-	26	56
Lead (Total)	-	<3	<14	-	<3	<9	-	<7	<9
Zinc (Total)	-	<11	<6	-	<4	<17	-	6.5	<20

[1] Metals loading comparison are vey limited between 1985, 1992 surveys between parameters/stations. No metals samples taken in 1978 survey.

TABLE 27 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

COMPARISON OF AVERAGE LOADINGS 1978, 1985, 1992 SURVEYS
(All parameter loadings in lbs/day)

STATION:	HS14			HS16A			HS19A		
YEAR:	1978	1985	1992	1978	1985	1992	1978	1985	1992
Parameter									
Flow (cfs)*	101	48	116	128	65	149	172	90	207
BOD_5	3,369	1,058	2,138	3,098	1,643	2,691	4,904	2,082	2,751
TKN	625	597	499	688	584	471	925	852	705
Nitrate Nitrogen	217	232	678	482	314	1,176	370	339	1,057
Ammonia Nitrogen	22	28	27	21	10	48	19	44	57
Phosphorus	98	46	52	131	105	82	139	102	76
Suspended Solids	8,150	888	4,301	8,608	3,567	7,800	8,235	3,438	4,583
Total Solids	135,301	135,845	137,649	172,160	94,419	191,500	239,668	116,208	245,823
Chlorides	9,781	18,723	28,245	13,084	9,791	26,118	17,582	11,621	32,082
Metals[1]:									
Aluminum (Total)	-	-	56	-	42	165	-	-	117
Lead (Total)	-	-	<9	-	14	<33	-	-	<51
Zinc (Total)	-	-	<20	-	7	<24	-	-	34

TABLE 27 (CONTINUED)

1992 HOUSATONIC RIVER SURVEY

COMPARISON OF AVERAGE LOADINGS 1978, 1985, 1992 SURVEYS
(All parameter loadings in lbs/day)

STATION:	HS22			HS24			HS27		
YEAR:	1978	1985	1992	1978	1985	1992	1978	1985	1992
Parameter									
Flow (cfs)*	195	108	219	222	123	306	253	140	362
BOD_5	5,560	2,498	3,633	7,166	2,779	5,001	8,439	3,013	4,173
TKN	1,206	755	755	1,170	1,257	1,085	1,334	1,325	1,078
Nitrate Nitrogen	402	290	1,089	239	265	1,507	272	151	1,507
Ammonia Nitrogen	31	46	43	36	65	61	27	60	46
Phosphorus	157	104	141	167	106	145	149	98	128
Suspended Solids	15,736	8,134	50,804	17,318	6,948	26,242	20,417	9,264	15,539
Total Solids	295,846	162,691	302,433	324,865	181,978	383,333	340,045	188,300	60,133
Chlorides	18,883	18,593	33,695	23,887	16,543	46,700	-	-	-
Metals[1]:									
Aluminum (Total)	-	-	371	-	<66	368	-	<75	<471
Lead (Total)	-	-	<43	-	<26	<67	-	<30	<89
Zinc (Total)	-	-	27	-	<13	162	-	15	119

1992 HOUSATONIC RIVER BASIN WATER QUALITY TRENDS AND ANALYSIS

The Housatonic Basin has continued to make slow improvements in overall water quality between 1978 and 1992. Prior to that, the 1970-78 period saw dramatic improvements. Conditions in the 1960's and before witnessed a mainstem river in deplorable condition: poorly treated sanitary wastes from population centers such as Pittsfield, and numerous paper product, electric generator, and other industries produced poorly treated wastes of all sorts which were a human health hazard, as well as an aesthetic eyesore throughout the basin.

The 1978 Housatonic River Survey Report demonstrated that the combination of improved domestic and industrial waste treatment and the EPA-State stepped up regulatory point source discharge permit program had resulted in dramatic improvements in water quality in the time period 1970-1978.

It is difficult to compare data from surveys of just several days each in 1978, 1985, 1992. It has to be assumed that the data obtained from each survey were representative of that particular time period. If this is true, then the data from the particular survey would represent an approximate snapshot of water quality conditions for the general period of time. Then again, the survey results might not be representative of the period, and therefore any comparison with other period would be scientifically invalid.

Additionally, dry weather versus wet weather are situations leading to radically different water quality conditions, making the data sets from both virtually incomparable. 1978 had weather and flows which were very similar to those of August 4 and September 22 in the 1992 survey, while the 1985 flows average much lower, and the August 5, 1992 flows were very high following heavy rainfall. Therefore, the only comparable data from the three survey years would be results of the 1978 survey, and the results from parts of the 1992 survey (August 4, September 22).

In comparing the 1978 data with the 1992 data (August 4, September 22), there are reductions between 1978 and 1992 in: BOD_5, TKN, Phosphorus, Suspended Solids concentrations and loadings along the mainstem portions of the basin. There are slight reductions in total solids concentrations and loadings in much of the basin. However, ammonia nitrogen and nitrate nitrogen showed increased concentrations and loadings over the same time period.

Dissolved Oxygen levels have improved over the period, while pH levels have declined. Turbidity levels have improved, while Chloride concentration and loadings levels have gone up. Fecal Coliform levels have gone up, particularly since the 1985 survey. With regard to metals, it can categorically be said that they do not pose major water quality problems, basinwide. Only total iron and total aluminum show slightly elevated concentration and loadings levels, and these are really not at the levels of critical environmental concern. (Trends between 1978 and 1992 on above parameters can be seen on Figures 16-27.)

The Housatonic Tributary data showed similar to slightly better trends over the same time period. Dissolved oxygen levels improved, as well as BOD_5, ammonia nitrogen, TKN, total phosphorus concentrations and loadings. Nitrate nitrogen and total solids concentrations and loadings remained the same while suspended solids and chloride concentrations and loadings increased. Fecal coliform increased also.

Overall, basinwide water quality conditions have improved some between 1978 to 1992. Certainly the upgrading of the Pittsfield WWTP in the 1980's, and more vigorous NPDES discharge permitting controls on other dischargers in the basin have helped with phosphorus and certain other nutrient loadings. However, from the data, as well as visual observations, many problems remain.

Fecal coliform levels do not meet water quality standards in almost every case basinwide: in fact, levels are increased over 1985 and 1978 levels. This is despite seasonal disinfection of effluents at most municipal waste treatment

facilities during summer months. Failing septic systems, stormwater and urban runoff, as well as runoff from agricultural land all contribute to the problem. It should be especially noted that in the southern portion of the basin, from West Stockbridge to the Connecticut Line, there are a lot of river bottom lands used as cornfields, as well as for cattle grazing.

Instances of solids/siltation in the water column were observed in the mainstem particularly downstream of the confluence of the east and west branches in Pittsfield. One source of this was discovered during the August Survey: approximately one-half mile downstream from the Lee WWTP discharge, in a 2-3 square mile area east of the river, a major gas transmission line was being constructed. A lot of landscape was torn up, and there was significant evidence of heavy siltation and soil erosion affecting tributaries which directly emptied into the mainstem. Survey staff conducted a canoe run along this portion of the mainstem and verified this. Additionally, paper making dischargers were witnessed, on numerous occasions, to be discharging murky-colored solids into the mainstem.

Also, a municipal WWTP discharge in the southern part of the basin had a color dye problem in its effluent (source: probably a paper industry discharger tied into that system). Obviously, paper product industry dischargers throughout the basin still had solids problems with their effluents, which were contributing to remaining water column solids loadings in many parts of the basin.

Phosphorus and nitrogen loadings continue to be a problem in the basin, though levels have generally reduced slightly over the past decade (except for nitrite nitrogen). Over the fifteen-year period, average phosphorus concentrations have declined by 50% and average loadings by 35%. However, the Lake Lillinonah, Connecticut algae/chlorophyll study done during summer 1992 (see Table 21) indicated eutrophic conditions in this lake. The presence of significant nutrient phosphorus levels in the water column continue to contribute to the eutrophic conditions in Lake Lillinonah, Connecticut.

PCB concentrations in the river water column, sediments, and fish tissue were not addressed at all in this study, although limited samples for PCB's at several discharges were taken during the sampling period. Bi-annual fish studies performed by the State of Connecticut, plus studies by the Massachusetts Division of Fisheries & Wildlife, and Blasland and Bouck, Inc. all indicate the continued presence of PCB's, particularly in impoundment sediments, and in the flesh of certain fish species.

All mainstem water quality tests for purgeable organic compounds showed no organics present; however, tests at General Electric showed low levels of Bromoform, Dibromochloromethane and Bromodichloromethane.

It should be noted that chloride concentrations in the water column, and in-stream loadings have nearly doubled since 1978 throughout the basin. Over the past decade, the combination of increased chlorides in paper industry wastes, as well as highway road-salt applications in winter have probably resulted in these increases.

Considerable effort during the survey was directed toward collecting metal samples (both total and dissolved). Results clearly demonstrate that metals are not a problem in the water column throughout the basin. No comparison can be made between 1978 and 1992 since metals were not sampled in 1978, and very little comparison can be made with 1985. Iron in the water column could be due to the bedrock geology in the basin, while the aluminum is probably largely due to both geology and paper making dischargers, many of which currently utilize aluminum in their waste treatment processes.

RECOMMENDATIONS

(1) Continue compliance efforts with all important municipal and industrial dischargers, with a focussed attention on all paper making industries. With respect to these industries, write stricter solids limits into their permit limits when they are renewed, e.g., parameters such as: Total/Suspended Solids; Color Units; Aluminum; AND require toxicity testing. Facilitate assistance from DEP BWP Industrial Waste staff to assist the paper industry dischargers to apply the best technological practices available in that particular waste treatment process. Where all else fails, facilitate enforcement actions through the Western Regional Office.

(2) Continue a basinwide appraisal of contributors of phosphorus to the water column, and effectiveness of phosphorus removal at Pittsfield WWTP as well as other dischargers in the basin. Dovetail with recommendations 4 below, to look for phosphorus contributors such as agriculture/animal husbandry.

(3) Follow up activities regarding PCB's in sediments and fish.

a) Follow up activities to Appendix 1, "DEP's review of the Mass. Contingency Plan Interim Phase II Report/Current Assessment Summary for Housatonic River."

b) Follow up contact with General Electric in Pittsfield to find out more about their experimentation with reducing PCB's in sediments in Wood's Pond.

c) Conduct an DEP/OWM fish flesh PCB study, with a focus on levels in fish in tributaries as well as mainstem.

(4) Facilitate through the Nonpoint Source Program a major assessment study with BMP recommendations and implementation practices on major nonpoint source contributors to water quality problems throughout the basin (this to help solve Fecal Coliform, and Phosphorus problems).

(5) Initiate further assessment activities in 1997 in accordance with the Department of Environmental Protection's watershed-based water quality management program, and in anticipation of setting effluent limits for NPDES permits to be issued in 1999.

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